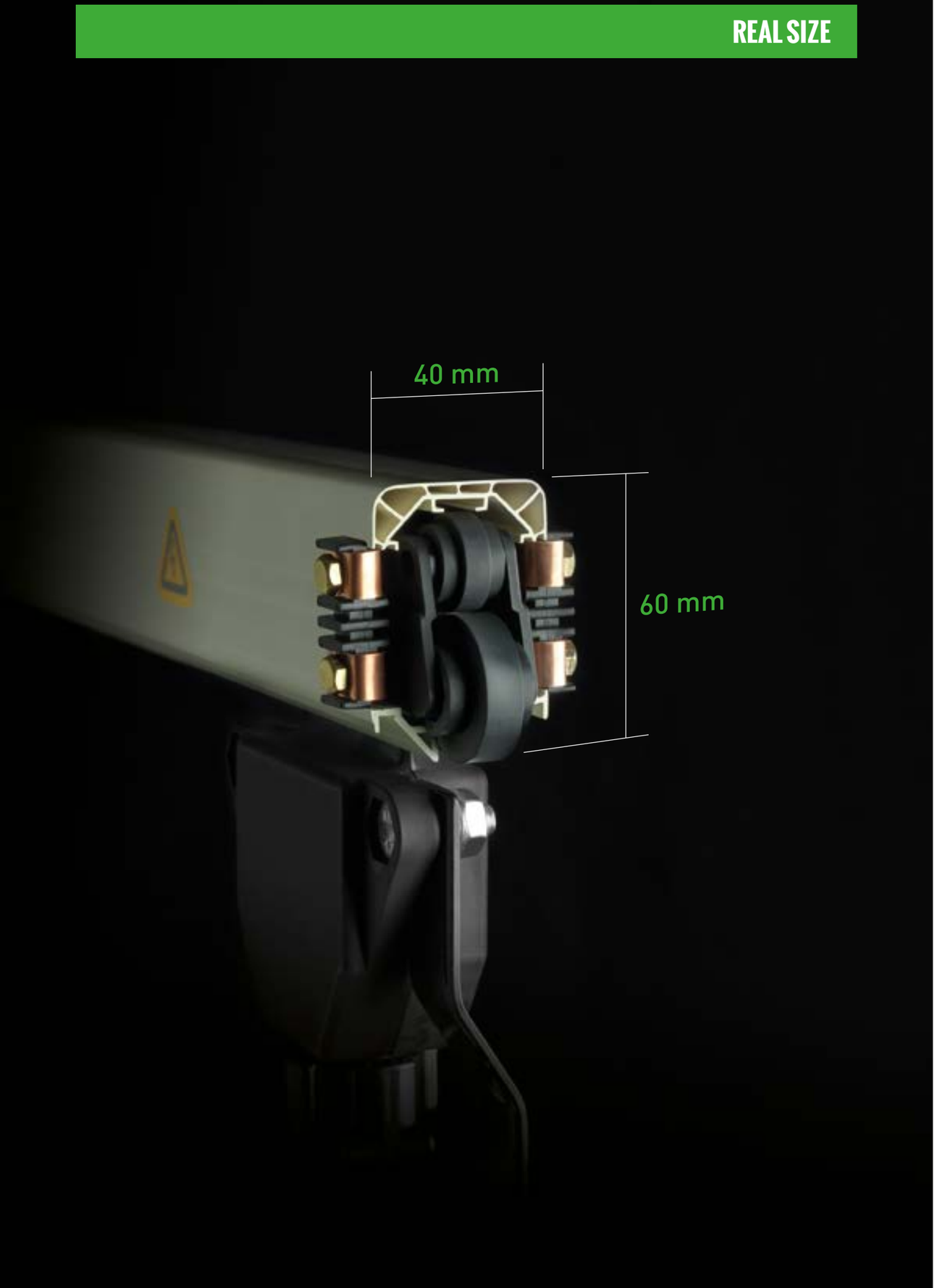
RG

# MINIMODUCTOR®

## MULTICONDUCTOR MODULAR SYSTEM

## 15 – 25 – 40 and 60 AMPS

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CERTIFICADO DE APROBACIÓN

Certificamos que el Sistema de Gestión de Calidad de

GASORI, S.L.
Pol. Ind. Anguciana, C/ La Loma, nº 2
26210 Anguciana, La Rioja
España

ha sido aprobado por Lloyd's Register Quality Assurance
de acuerdo con la siguiente Norma de Sistema de Gestión de Calidad

ISO 9001:2008

El Sistema de Gestión de Calidad es aplicable a

Corte por láser de chapa y tubo, mecanizado, plegado, soldadura y ensamblado de componentes metálicos. Diseño, producción y comercialización de líneas de alimentación eléctrica a equipos móviles con desplazamiento. Producción y comercialización de equipos de mando y control eléctricos y conductores para mandos.

CERTIFICADO DE APROBACIÓN

CERTIFICADO DE CONFORMIDAD DEL CONTROL DE PRODUCCIÓN EN FABRICA

Fabricante: GASORI, S.L.
c/ La Loma, 2 (Pol. Ind. Anguciana)
26210 Anguciana (La Rioja)

# RG APPLICATIONS

MINIMODUCTOR is designed as the answer to a market demand for a protected line of MINIMUM size, MODULAR, and EASY ASSEMBLY and SERVICE SAFETY, for the electrical power supply of mobile equipment like hoists, gantry cranes, trippers, textile lines, automated warehouses, etc....

Therefore, we have designed the new MINIMODUCTOR system available in 4 or 5 conductors, and apt for intensities of 15, 25, 40 and 60 amps.

The insulation profile has a standard length of 4 meters and the conductors are housed inside the same.

The joint between bars of the conductors is by means of connection plates fixed with bolts and nut that is housed in an insulator with the mission of avoiding possible short circuits among phases.
Each electrical joint is protected with an insulating joint that surrounds the profile.

# FEATURES RG

## SAFETY:

Line protected by its external isolation. First on the market with coextruded sealing strips.

## SPACE:

The MINIMODUCTOR line occupies minimum space compared with other conventional electrical power supply systems.

## EXPANSION / CONTRACTION:

The system absorbs length differences caused by expansion / contraction at each joint of the bar, without the need for “special” expansion / contraction joints.

## ENLARGEMENTS:

Being a modular system, the installation can be enlarged or reduced by adding or removing sections.

## ASSEMBLY:

Quick and simple: a single assembly track leaves the line ready for service.

## ELECTRICAL SUPPLY:

At the beginning of the line or at any of the joints between bars (connections).

## REPAIRS:

Sections of the already assembled line can be replaced without the need of moving the rest of the line.

## VOLTAGE:

Up to 600 V

## OPERATIONAL TEMPERATURE:

From -30ºC to +55ºC.

## OUTDOOR INSTALLATIONS:

We recommend protecting the line from solar radiation, using adequate protection. (See page 15)

## DEGREE OF PROTECTION:

IP13 according CEI EN 60529.

# LINE CALCULATIONS

To choose the most suitable line required for a certain current and to define the location of the supply point/s, add up all the currents of any motors that could be in simultaneous operation, as well as any foreseeable voltage drop.

The simultaneity of Starting currents (IA) and Service currents (IN) will be added.

The following table is a guideline for supplying one or several units.

| NUMBER OF UNITS | MOST POWERFUL MOTOR | 2ND MOST POWERFUL MOTOR | 3RD MOST POWERFUL MOTOR | 4TH MOST POWERFUL MOTOR |
|---|---|---|---|---|
| 1 | $I_A$ | $I_N$ | - | - |
| 2 | $I_A$ | $I_N$ | $I_N$ | - |
| 3 | $I_A$ | $I_A$ | - | - |
| 4 | $I_A$ | $I_A$ | $I_N$ | - |

**Starting Current ($I_A$)** is that used by the motor when its rotor is stopped. This detail is characteristic of the motor and is measured during the tests of the motors, and according to the REBT in its first Instruction ITC-BT-47 this should not exceed, in alternative current the following values

| MOTOR POWER | $I_A/I_N$ |
|---|---|
| From 0,75 Kw to 1,5 Kw | 4,5 |
| From 1,5 Kw to 5 Kw | 3 |
| From 5 Kw to 15 Kw | 2 |
| More than 15 Kw | 1,5 |

**As an example, indicate the following:**

MOTOR - COIL WINDING: IA = 2 IN
MOTOR - SQUIRREL CAGE: IA = 5 IN
MOTOR WITH FREQUENCY CONVERTER: IA = 2 IN

**Nominal current ($I_N$)** is that used by the motor when it develops its nominal power, connected to nominal voltage. This value is obtained with the following formula:

$$I_N = \frac{P}{\sqrt{3} \cdot V \cdot \cos \varphi}$$

**$I_N$ =** Nominal current in amps.
**P** = Power in watts
**V** = Voltage between phases
**Cos φ** = Power factor

The power factor or Cos. φ is an "electrical quality factor" of the motor. The greater this is, less current will be absorbed to develop the same power. Its value tells us the "quality" of the motor regarding its consumption; we consider its value as 1.





The voltage drop for alternative three-phase current is calculated by means of this formula:

$$\Delta U = \sqrt{3} \cdot I \cdot L \cdot Z$$

$$\Delta U(\%) = \frac{\Delta U \cdot 100}{U}$$

**ΔU =** Voltage drop (Volts)
**I =** Current (Amps)
**L =** Considered length (meters).
**Z =** Impedance of conductors (Ω/)

Value L (length considered in meters) varies according to the location of the power supply:

- With a supply at one end: L = length of the line
- With a central supply: L = length of the line / 2
- With supply at both ends: L = length of the line / 4
- Supply at 1/6 from each end: L = length of the line / 6
- With a central supply and at 1/10 from each end: L = length of the line / 10

This value is also reduced when considering the width of mobile machines , and increases when taking into account the length of the cable from the supply to the line to the electricity control panel.

| POWER | | THREE-PHASE CURRENT 400 VAC | | RECOMMENDED LINE INTENSITY |
|---|---|---|---|---|
| CV - HP | Kw | $I_N$ | $I_A$ | |
| 0,50 | 0,37 | 0,67 | 3,01 | 15 A |
| 0,75 | 0,55 | 1 | 4,49 | |
| 1 | 0,74 | 1,33 | 5,98 | |
| 1,5 | 1,10 | 1,99 | 8,97 | |
| 2 | 1,47 | 2,66 | 7,98 | |
| 3 | 2,21 | 3,99 | 11,97 | 25 A |
| 4 | 2,94 | 5,32 | 15,95 | |
| 5 | 3,68 | 6,65 | 19,94 | |
| 7,5 | 5,52 | 9,97 | 19,95 | |
| 10 | 7,36 | 13,29 | 26,59 | 40 A |
| 13 | 9,57 | 17,28 | 34,57 | |
| 15 | 11,04 | 19,94 | 39,88 | 60 A |
| 20 | 14,72 | 26,59 | 39,90 | |
| 25 | 18,40 | 33,24 | 49,86 | |
| 27 | 19,87 | 36,40 | 54,15 | |

## INSULATION PROFILE

**Material:** Polyvinyl chloride (PVC) rigid, lead free. Self-extinguishing.

| DESCRIPTION | STANDARD | UNIT | VALUE |
|---|---|---|---|
| ELASTICITY MODULE | ISO 527 | N / mm² | 3.500 |
| BENDING MODULE | ISO 178 | N / mm² | 3.100 |
| ELASTICITY LIMIT | ISO 527 | N / mm² | 37 |
| RESISTANCE TO TRACTION | ISO 527 | N / mm² | 35 |
| LENGTHENING OF THE BREAKAGE | ISO 527 | % | 110 |
| IZOD IMPACT STRENGTH TEST | ISO 180 | J / m | 50 |
| TEMP. DG SOFTENING VICAT | ISO 306/B- -50º C/**h** | ºC | 83 |
| CATEGORY UL94 | UL94 | - | VO |
| DIELECTRIC RESISTANCE | UL746 | V / mil | 544 |
| VOLUMETRIC RESISTIVITY (23ºC) | ASTM D257 IEC 93 | Ohm*cm | 1*10^16 |
| WORKING TEMPERATURE | - | ºC | -30ºC +55ºC |

## CONDUCTORS

**Material:** Electrolyte copper strip, according to CEI EN 13599 standards and certified CU-ETP quality.

EXPANSION / CONTRACTION COEFFICIENT 0,0165 mm/M/ºC

RESISTIVITY 0,0172 Ω/m/mm²

DENSITY 8,9 g/cm³

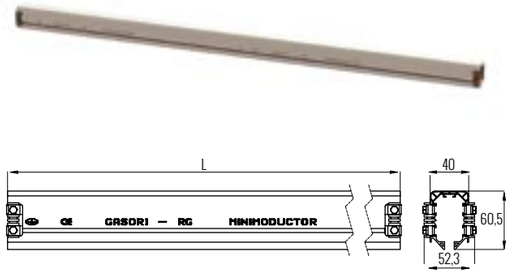
IACS CONDUCTIVITY 100

| CURRENT A | VOLTAGE V | SECTION mm² | WEIGHT g/m | IMPEDANCE Ω m * 10⁻⁴ |
|---|---|---|---|---|
| 15 | 500 | 6 | 53,40 | 29,89 |
| 25 | 500 | 8 | 71,20 | 23,54 |
| 40 | 500 | 10 | 89 | 17,58 |
| 60 | 500 | 15 | 124,60 | 12,66 |





## 15, 25, 40 y 60 AMP BAR

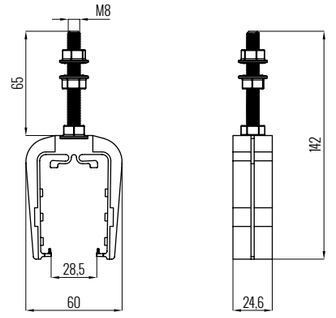



Standard length: 4000 mm.

**REFERENCES**

| Description | Reference | Weight / m. |
|---|---|---|
| Bar with 4 conductors 15 A | RGMM 4x15A | 827 |
| Bar with 5 conductors 15 A | RGMM 5x15A | 890 |
| Bar with 4 conductors 25 A | RGMM 4x25A | 898 |
| Bar with 5 conductors 25 A | RGMM 5x25A | 979 |
| Bar with 4 conductors 40 A | RGMM 4x40A | 969 |
| Bar with 5 conductors 40 A | RGMM 5x40A | 1.068 |
| Bar with 4 conductors 60 A | RGMM 4x60A | 1.111 |
| Bar with 5 conductors 60 A | RGMM 5x60A | 1.246 |

## SLIDING PLASTIC SUPPORT RGMM01




Manufactured from insulating plastic material.

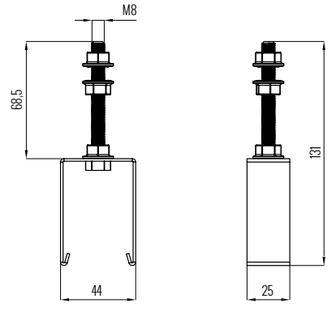
Supports the conductor bars allowing its displacement by expanding or contracting as an effect of the temperature difference.

Placed at 2 meters from each other. In lines outside place at 1.33m from each other.

It is fixed to the structure by means of an M8 height adjustable screw with its corresponding nuts.

**Weight:** 69 gr.

## METALLIC SLIDING SUPPORT RGMM01M



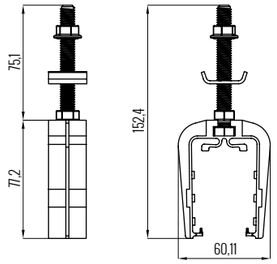

Manufactured from steel sheet with red Epoxy paint finish RAL 3002.

Apt for interior lines and especially recommendable for outside installations.

As in the previous case, place them at 2m from each other, and in outside installations at 1.33m

**Weight:** 98 gr.

## PLASTIC SLIDING SUPPORT RGMM01-SU (FOR USE IN UNIVERSAL SUPPORTS)

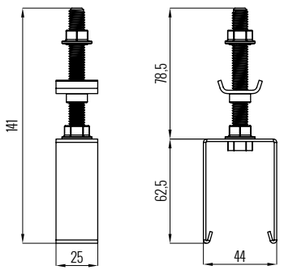



Designed for its specific use in Universal Supports SUMM, SUGMM, and SUVMM (see page 17).

It incorporates a trapezoidal nut to safely anchor the profile of system lift.

**Weight:** 104 gr.

## METALLIC SLIDING SUPPORT RGMM01M-SU (FOR USE IN UNIVERSAL SUPPORTS)




As in the previous case its specific use in Universal Supports SUMM, SUGMM, and SUVMM (see page 17).

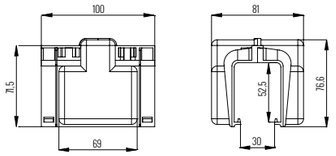
It incorporates a trapezoidal nut to safely anchor the profile of system lift.

**Weight:** 133 gr.





## JOINT RGMM02



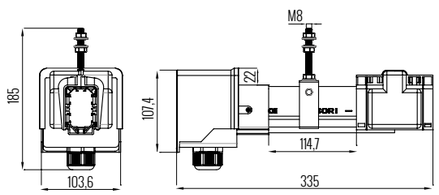

Manufactured from insulating plastic material.

Protects the electrical connections at the joint points of the conductors.

It has two halves that are coupled to the conductor bar and its closure is by means of pressure tabs.

**Weight:** 100 gr.

## END FEED UNIT (SEE REF. IN CHART)




Unit consisting of a power supply box with glands M25x1.5, a 205mm long section of conductor bar, one fixed point RGMM05, and one-line joint RGMM02.

Designed to make a rapid and comfortable power supply to the installation at one end.

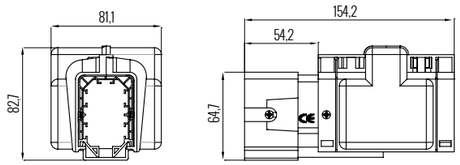
There are two types, according to the number of line conductors:

| No. of conductors | End feed unit reference | Complete weight (gr.) |
|---|---|---|
| 4 | RRMM03 - 460 | 635 |
| 5 | RRMM03 - 560 | 666 |

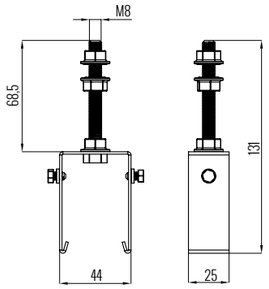
## END CAP UNIT RGMM04

Unit consisting of the external cover with a 100mm long section of conductor bar and a line joint RGMM02 fitted with some self-tapping screws to fix to a conductor bar, this way assuring its fixing to the system.

**Weight:** 200 gr.




## FIXED POINT RGMM05




Manufactured from steel sheet with blue Epoxy paint finish RAL 5010.

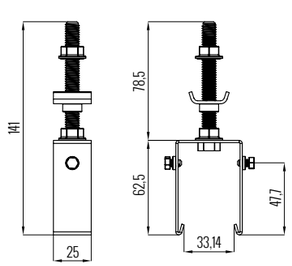
Its mission is to avoid line displacement, assuring its fixing to the structure and this way guiding the expansion of the system.

The assembly assures its fixing to the conductor bar by means of tightening the M5 brass screws.

It is always located beside the line power supplies (see end and intermediate power supply units).

**Weight:** 100 gr.

## FIXED POINT Ref. RGMM05-SU (FOR USE IN UNIVERSAL SUPPORTS)




Designed for its specific use in Universal Supports SUMM, SUGMM, and SUVMM (see page 17).

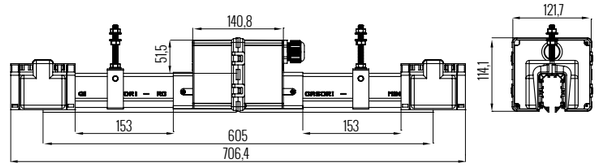
It incorporates a trapezoidal nut to safely anchor the profile of system lift.

**Weight:** 135 gr.





## LINE FEED UNIT (SEE REF. IN CHART)



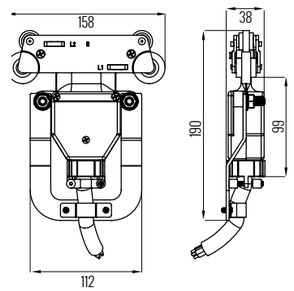

Conjunto formado por una caja de acometida intermedia con un prensaestopas M25x1,5, dos tramos de barra conductora de 300mm cada uno, dos punto fijos RGMM05, así como dos empalmes de línea RGMM02.

Diseñada para realizar una rápida y cómoda acometida eléctrica a la línea en cualquier unión entre dos barras conductoras de la instalación.

En función del número de conductores de la línea, así como su amperaje, tenemos las siguientes referencias:

| No. of conductors | Amperage AMPS. | Line feed unit reference | Complete weight (gr.) |
|---|---|---|---|
| 4 | 15 | RGMM07 - 415 | 1.122 |
| 4 | 25 | RGMM07 - 425 | 1.145 |
| 4 | 40 | RGMM07 - 440 | 1.177 |
| 4 | 60 | RGMM07 - 460 | 1.265 |
| 5 | 15 | RGMM07 - 515 | 1.142 |
| 5 | 25 | RGMM07 - 525 | 1.199 |
| 5 | 40 | RGMM07 - 540 | 1.239 |
| 5 | 60 | RGMM07 - 560 | 1.349 |

## CURRENT COLLECTOR TROLLEY 25 A (SEE REF. IN CHART)




Central body manufactured from insulation material with metal-graphite brushes.

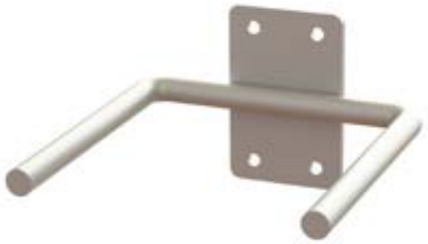
Fitted with four rollers to assure correct guiding throughout the installation.

To avoid interchanging phases, the cart has only one position to be fixed in its profile. On one side the cart has an anti-inverter limit that breaks the symmetries of the same.

It is supplied with its metal puller, as well as connections by means of 4G4mm2 or 5G4mm2 cable, whichever the case, of 3m length.

| No. of brushes | Trolley reference | Complete weight (gr.) |
|---|---|---|
| 4 | RGMM14 | 1.111 |
| 5 | RGMM15 | 1.155 |

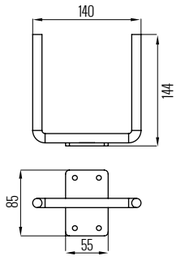
## TOWING ARM FOR TROLLEY 25 A RGMM06



Manufactured from galvanised steel

It is screwed to the mobile unit to be supplied. The arm pulls the collector cart to contact with the metallic puller included in the mentioned cart

**Weight:** 1.650 gr.

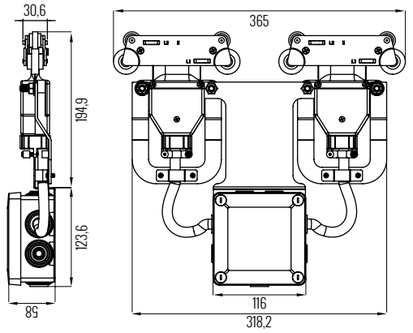



## DOUBLE CURRENT COLLECTOR TROLLEY 50 A (SEE CHART)

Indicated for intensities between 25 and 60 Amps, that way for those mobile units fitted with frequency converter motors.
These are two single carts (RGMM14 or RGMM15) linked by means of a metal plate fitted with a connection box. Supplied with primary connections already made.

The following models are available according to the amount of brushes:

| No. of brushes | Trolley reference | Complete weight (gr.) |
|---|---|---|
| 4 | RGMM24 | 1.861 |
| 5 | RGMM25 | 2.088 |







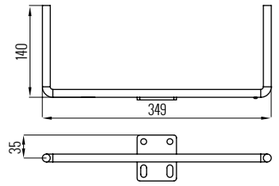

## TOWING ARM FOR TROLLEY 50A RGMM08

Manufactured from galvanised steel

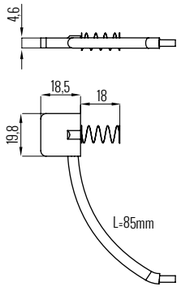
Its is screwed to the mobile unit to be supplied. The arm pulls the collector cart to contact with the metallic puller

included in the double cart

**Weight:** 1.850 gr.



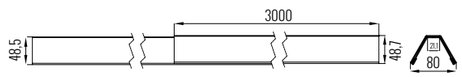

## CARBON BRUSH RGMM11




This is a consumable item
Manufactured under UNE-EN-20027-1 Standards: 1978 and IEC 276: 1968 + A1: 1997.
They consist of a mixture of copper and graphite, N51 quality

**Weight:** 12 gr.

## OUTDOOR COVER L=3m RG93



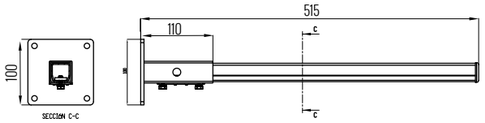

Especially recommended to protect the MINIMODUCTOR system form the action of atmospheric agents like solar action, rain, snow, etc...

The sliding supports RGMM-01 will be used every 1.33 m for this application.

The cover consists of a lower roof RG93-1, and another upper one RG93-2, in both cases 3m long.

They will be placed offset against each other, so that in the joint between them there is always a roof closing the same. See diagram:

## WALL SUPPORT RGMM20




Assembly system for wall fixing and supports for the line RGMM-01 and the fixed point RGMM-05.

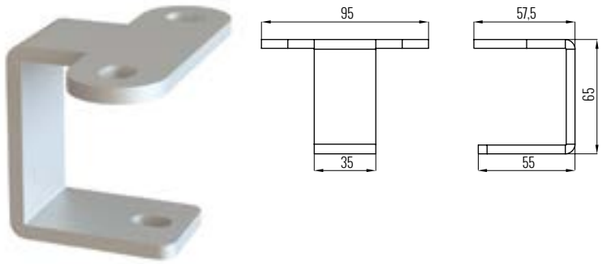
Eliminates welding and allows corrections for good supply of the system.

Recoverable in case of change of location or re design of the line. Galvanized steel

Standard profile length: 500 mm. (can be supplied in other lengths on demand)

**Weight:** 1.825 g.

## CEILING SUPPORT RGMM21




Assembly system for ceiling installation of the supports for the line RGMM-01 and the fixed point RGMM-05.

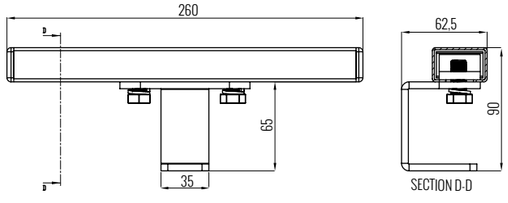
Eliminates welding.

Can be re-used in the case of displacement or re-design of the line.

Galvanized steel

**Weight:** 250 g.

## SLIDING CEILING SUPPORT RGMM23




Represents an option for assembly to install a ceil ing support for line RGMM-01 and fixed point.

Eliminates welding and this model allows perpendicular corrections of the line for good alignment of the system.

Recoverable in case of change of location or re-design of the line.

Galvanized steel

**Standard profile length:** 250 mm.

**Weight:** 850 g.

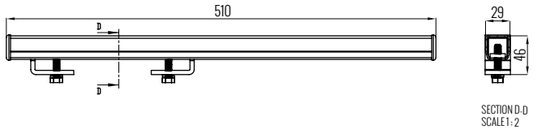
(can be supplied in other lengths on demand).



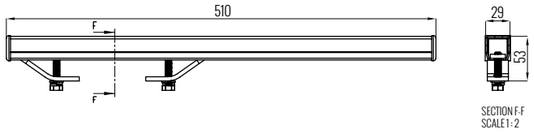


## UNIVERSAL SUPPORTS

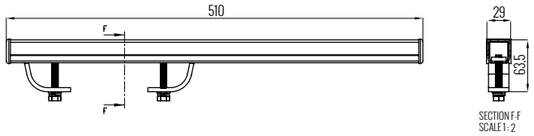
### Ref. SUMM-500 for flange ≤ 10 mm




### Ref. SUGMM-500 10 mm ≤ flange ≤ 20 mm




### Ref. SUVMM-500 20 mm ≤ flange ≤ 30 mm

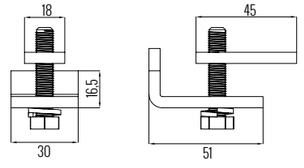



Represents an option for assembly to install the line supports RGMM01-SU or RGMM01M-SU and the fixed point RGMM05-SU.
Eliminates welding and allows corrections for good system supply.
Recoverable in case of change of location or re- designing the line.
Consisting of perforated profile made from galvanized steel and 2 galvanized steel clamps for fixing with bolts, to standardized beams in these shapes: IPN, IPE, IPS, IPR, HEB, HEA or HEM.

**Standard profile length:** 500 mm.
(can be supplied in other lengths on demand)

**Weight SUMM-500:** 690 gr.
**Weight SUGMM-500:** 710 gr.
**Weight SUVMM-500:** 790 gr.

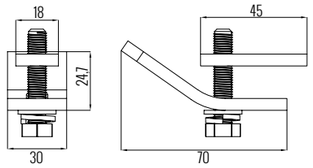
## BEAM CLAMP FOR FLANGE ≤ 10 mm. Ref. RG2812




System component SUMM-500. Made from threaded plate, curved plate, M10 bolt and grover washer, Galvanized steel

**Weight:** 115 gr.

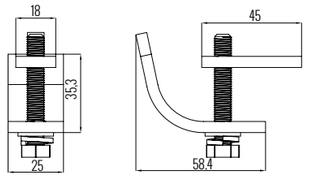
## BEAM CLAMP 10 mm ≤ FLANGE ≤ 20 mm. Ref. RG2821




System component SUGMM-500.
Made from threaded plate, curved plate,
M8 bolt and grover washe.
Galvanized steel.

**Peso:** 125 gr.

## BEAM CLAMP 20 mm ≤ FLANGE ≤ 30 mm. Ref. RG2830




System component SUVMM-500.
Made from threaded plate, curved plate,
M8 bolt and grover washe.
Galvanized steel.

**Peso:** 125 gr.

## UNIVERSAL SUPPORT ASSEMBLIES

**1** Prepare the universal supports (or any other type), pre-assembling its components before the definite installation (Photo 1)

**2** Installation of these universal supports on the line beam, assuring the distance between them according to the assembly drawing corresponding to each amperage (Photos 2 and 3).

- for 15 A, 25 A, 40 A and 60 A every 2 m.
- for 15 A, 25 A, 40 A and 60 A every 1,33 m. if fitted with outside cover.

and for the fixed point, or non-sliding support, RGMM05 next to the line supply (Photos 3 and 4).

**3** Position the conductor bars screwing the sliding supports RGMM01 to the universal supports. Make sure you place all the bars in the same position, that is to say, the Earth line marked on the PVC profile, and the "RG" sticker should be located **ALWAYS ON THE SAME SIDE** (Photos 4 and 5). The internal design of the PVC profile is asymmetric, that way the collector trolley only has one position for location, avoiding any possible mistakes when connecting the phases.

**4** Joining 2 consecutive bars is done by connecting phase to phase the conductors, using the supplied connection plates and brass screws. (Photo 5).

**5** Cover the connection, sliding the **joints RGMM02 (both halves)** (Photo 6) until completely closed **(click)** using the pressure tabs (Photo 7).

**6** The electrical supply can be made either at one end of the line, end supply (Photo 8) Or it can be made by connecting at any of the section joints along the installation, intermediate supply (Photo 9).

In both cases it will be supplied with a kit so that only the section of conductor profile must be connected to the adjacent section of the installation, and later make the electrical connection to the grid (Photos 10, 11, 12 and13). In the case of intermediate power supply adjacent sections will be connected on both sides of the power supply box (Photos 14 y 15).

Then, joints RGMM02 will be fitted, and finally the fixed points RGMM05 will fixed to the universal supports that are for guiding the expansions of the system.

**7** Introduce in the end of the line, or using any housing joint, the collector trolley, by manually pressing the brushes, taking into account it only has one position: The brush marked as "Earth " has to be located on the side of the PVC profile indicated with black and white stripes, and with an "RG" sticker (Photo 16).

Later close the line by means of the end cover unit RGMM04, fitting the joint RGMM02, and tightening the self-threading screws that are fitted in the mentioned joint (Photos 17 y 18).

**8** Install the corresponding towing arm RGMM06 or RGMM08, aligning it with the central axis of the conductor bars, and slightly lower than the collector trolley. It is very important that the pulling is parallel to the axis of the line. The collector trolley cable should be installed forming sufficient loop, to not cause any torsion of the trolley (Photos 19 and 20).

**9** Before making the connection to the mains of the line manually check that the collector trolley moves freely along the installation, without any abrupt movements, paying special attention to the joints between bars.

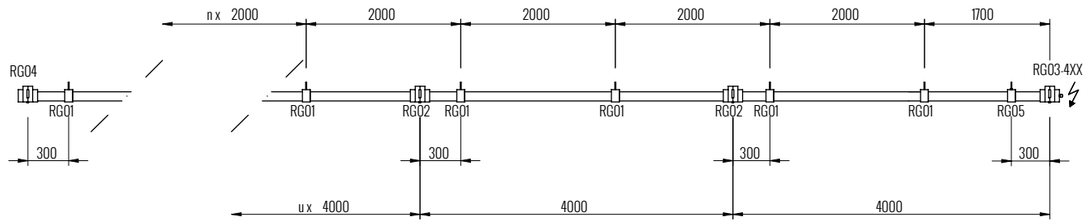
**10** Make the connection to the mains, and check that the installation works correctly.



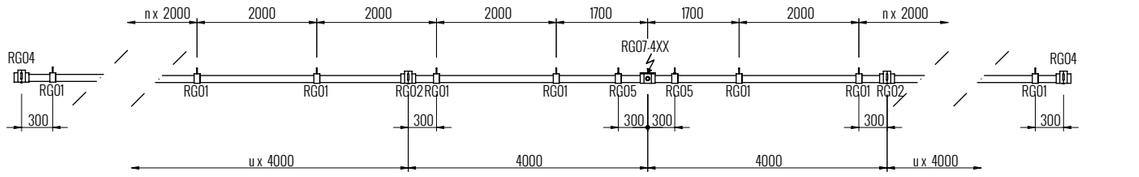


## FOR LINES 15A, 25 A, 40 A and 60 A (supports every 2 m.)

### With end feed

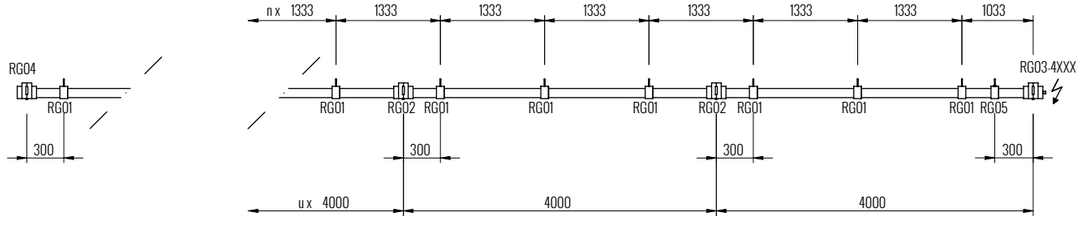



### With line feed

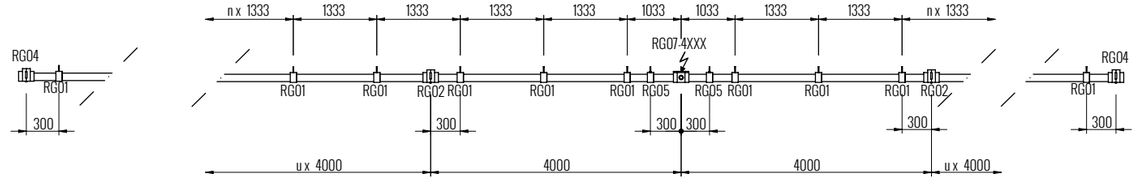



## FOR LINES 15A, 25 A, 40 A and 60 A WITH OUTSIDE COVER (supports every 1.33 m.)

### With end feed




### With line feed



# RG QUESTIONNAIRE

## QUESTIONNAIRE FOR COLLECTING DATA FOR PREPARING THE OFFER

**Company:** ..... **Contact person:** .....

**Tel:** .....

**E-mail:** ..... **Date:** .....

**1º Number of machines to be supplied:**

**2º Length (m):**

**3º Voltage (V) and Frequency (Hz):**

**4º Necessary Conductors:**

☐ Single phase ☐ 3+T ☐ 3+T+N ☐ Others

**5º Environmental Temperature (ºC)**

Minimum: Maximum:

**6º Type of installation:**

☐ Indoors ☐ Outdoors ☐ Mixed

**7º Special operational conditions:**

☐ Humidity ☐ Chemical agents (indicate which):

☐ High dust levels ☐ Others (Indicate):

**8º Line power supply:**

☐ End ☐ Intermediate ☐ Multiple

**9º Operational speed (m/min):**

**10º Line assembly layout:**

Double T (Indicate type and size):

Others (send diagram):

**11º Do you need our universal supports to avoid welding?**

☐ Yes ☐ No

**12º Maximum voltage drop admitted over nominal voltage (%):**

**13º Consumption of the motors to be supplied (Complete the table):**

| MOTORS | CRANE Nº1 | | | | CRANE Nº2 | | | | CRANE Nº3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Kw | Nominal consumption | Starting consumption | Motor type* | Kw | Nominal consumption | Starting consumption | Motor type* | Kw | Nominal consumption | Starting consumption | Motor type* |
| Elevation | | | | | | | | | | | | |
| Bridge movement | | | | | | | | | | | | |
| Trolley movement | | | | | | | | | | | | |
| Others | | | | | | | | | | | | |

**Motor type:**

**J =** Squirrel cage motor.
**A =** Slip-ring motor.
**V =** Motor in frequency converter.
**X =** Others.

**SEND THE FINISHED QUESTIONNAIRE TO: ventas@gasori.com**

RG

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