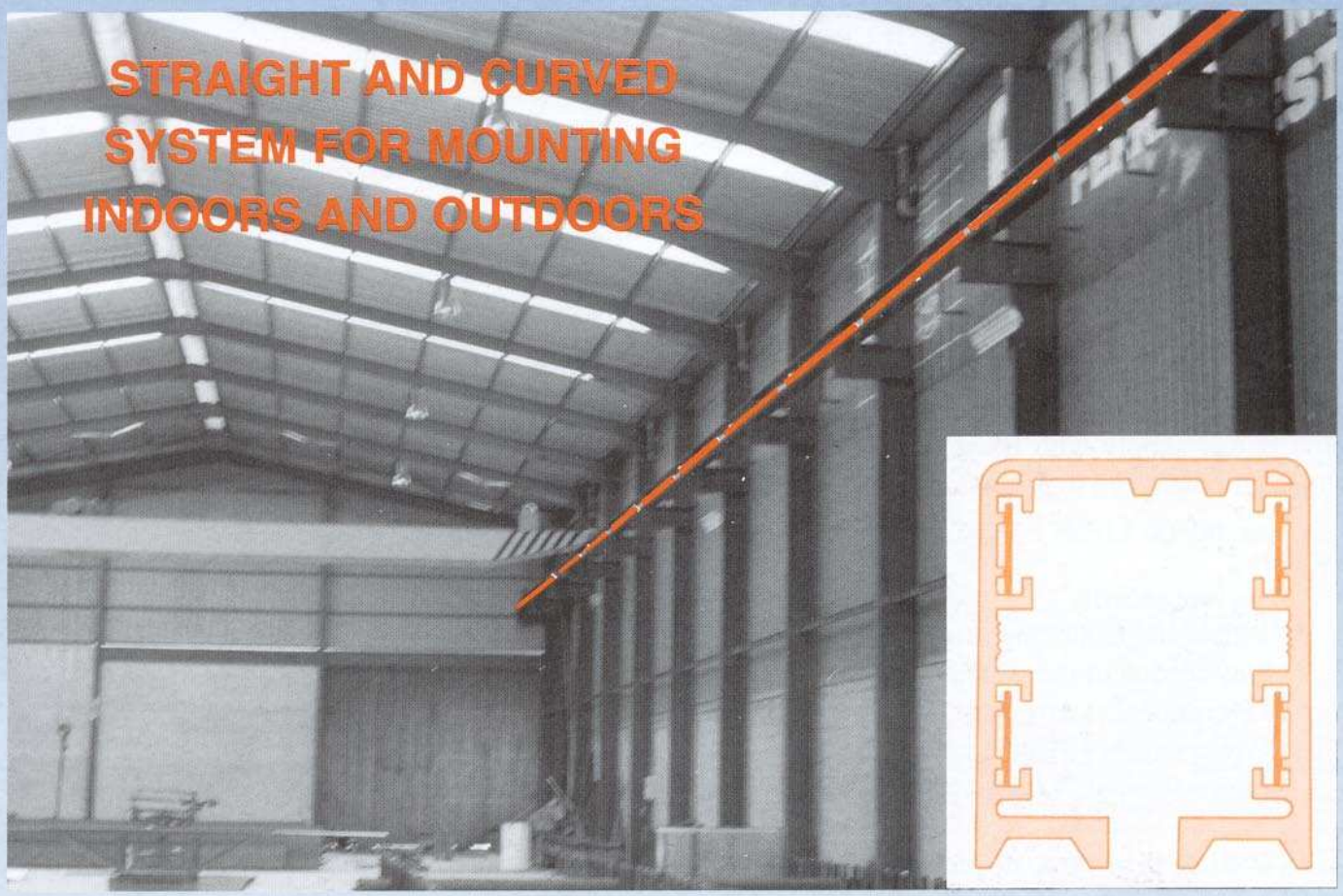
LM-4 MODULAR CONDUCTOR SYSTEM

PVC INSULATED 4 POLE CONDUCTOR SYSTEM FOR MOBILE POWER FEEDING

Amperages:

40 - 60 - 80 - 100 and 140 A.



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APPLICATIONS AND CHARACTERISTICS

Channelling electrical protection, with the use of current displacement. Applicable for security, like mobile electric power supply with fixed paths (straight or curved) on : cranes, hoists, moving electrical machinery, moving equipment and in general, wherever it is necessary to have mobile power.

Particulars :

- Service security .
- With a single moving assembly, the line remains separated for use .
- Any section of the system can be replaced, using 4m sections .
- Discretional extension of the system .
- Power supply by end feed or by line feed .
- Thermal expansion is absorbed by each module.

Classification of the degree of protection of the Modular System LM-4 (CEI 144, DIN 40 050 and UNE 20-324-89) : IP 237.

Introduced in PVC dielectric housing of four poles, earth pole is marked with a yellow strip, in different versions according to intensities. With assembly of various parallel systems, obtaining the major number of poles and higher current capacity. Conductors freely installed in the housing, permitting different expansions in the copper and the PVC, likewise dispersion of the heat providing for effect Joule.

Possibilities to assemble in indoors or in outdoors with service temperatures between -30° and +60°C. For outdoor installation, the mounting plan is different and the system components are specially treated and screws are made of stainless steel, they have various references.

Special installations : Lengths greater than 280 m, working curves, different diversions, mixed installations of outdoor-indoor etc. consult page 8 and our Technical Services, providing sketches and service conditions.

PVC HOUSING

Composition : Rigid auto-extinguishable PVC (UNE 20.672.83 p. 2-1). Accomplishes the specific conditions of the standard UNE 21-0995 part 9.8.1 on thermoplasticity to 70°C severity.

DIELECTRIC CHARACTERISTICS
Dielectric Strength ..... 25 Kv/mm.
Transverse Resistivity ..... $1x10^{16}$ Ohm/cm.

MECHANICAL CHARACTERISTICS
Bending Strength ..... 780 Kgrs./cm^2
Tensile Strength ..... >540 Kgrs./cm^2
Impact Resistance (DIN 53453) ..... No Failure

SERVICE TEMPERATURES
Continuous Operation ..... Between -30°C and + 60°C
Softening Point (VICAT) ..... 80 °C

DENSITY ..... 1,4 9± 0,02 grs./cm^3

EXPANSION COEFFICIENT ..... 0,05 mm/m/°C

RESISTANCE TO CHEMICAL AGENTS
Oils and Greasy Minerals ..... YES
Solvents ..... All, except aromatical cetanic and chlorated solvents.
Hydrochloric Acid ..... NO
Sulphuric Acid diluted to 50% ..... YES
Concentrated Sulphuric Acid ..... NO
Caustic Soda at 50% ..... Yes to < 40°C

INFLAMMABILITY
Auto-extinguishable, fire-resistant material

WATER ABSORPTION
Undetectable ..... < 0,07 %

CONDUCTORS

Fabricated in electrolytic copper strips, conforming to the standard DIN 1787 / 17670 / 40500 and quality CU-ETP certification.

Density: 8,9 gr./cm^3 Expansion coefficient: 0,0165 mm / m / °C. Conductivity IACS: 100

REF.	INTENSITY Amp.	VOLTAGE V.	IMPEDANCE Z Ω/m.	SECTION mm^2	Distance between cond. mm.	Voltage Drop* V/m/Amp.
LM-40	40	500	$2x10^{-3}$	9	15	0.00346
LM-60	60	500	$1.75x10^{-3}$	12	15	0.00303
LM-80	80	500	$1.18x10^{-3}$	16.5	15	0.00204
LM-100	100	500	$1x10^{-3}$	21	15	0.00173
LM-140	140	500	$0.75x10^{-3}$	30	15	0.00123

* Values of voltage drop are considered at 20 °C, cos φ = 1, E.D. 80 % in three-phase alternating current.

-With temperatures of 30°C apply correction factor 1,04
- " " " 40°C " " " 1,08
- " " " 50°C " " " 1,12

- Consumption values at 60 % E.D., apply correction factor 0,77

To determinate the system type and the location of the feeding points, the intensities of the main and auxiliary motors is considered along with the admissible voltage drop.

For the calculations, take into account the consumption of the motors at start up and during continuous work, accepting that starting intensities will be higher than the usual system allows (for a max. of 2 seconds) but only if voltage drop is admissible.

STARTING INTENSITIES AND NOMINAL INTENSITIES

The starting intensity is consumed when motor is at static rotor. It is a characteristic of the motor and its value is measured during the motor tests.
The nominal intensity is absorbed when the motor is working at nominal power and is connected to a nominal voltage. The following equation gives its value:

$$IN = \frac{P}{\sqrt{3} \times V \times \cos \varphi}$$

IN= Nominal intensity (amps.)
P= Power (watts)
V= Voltage over phases (volts).
Cosφ= Power factor.

POWER FACTOR

The power factor (Cosφ) is a quality electric factor of the motor. The higher it is, less intensity will be absorbed to give the same power. Its value indicates the "quality" of the motor related to its consumption. Its maximum value will be 1.

ORIENTATING VALUES FOR THE 4 POLES THREE-PHASE MOTOR NOMINAL CURRENTS. ACCORDING TO NF C63- 110.1970.

POWER		NOM. INTENSITY (Amp.)			RELATIONSHIP
C.V.	K.W.	220 V.	380 V.	500 V.	IA/IN
3	2,2	8,7	5	3,8	5
4	3	11,5	6,6	5	5
5,5	4	14,5	8,5	6,5	5,2
7,5	5,5	20	11,5	9	5,4
10	7,5	27	15,5	12	5,4
13,3	10	35	20	15	5,6
15	11	39	22	17	5,8
20	15	52	30	23	5,8
25	18,5	64	37	28,5	6
30	22	75	44	33	6
40	30	103	60	45	6,2
50	37	126	72,5	55	6,8
60	45	147	85	65	6,8
75	55	182	105	80	6,8

VOLTAGE DROP

For three-phase alternating current:

$$AU = \sqrt{3} \cdot I \cdot L \cdot Z$$

ΔU= Voltage drop in Volts.
I= Amperage in Amps.
L= Length in m.
Z= Impedance of the conductors in Ohm/m.

Lenght to be considered for the voltage drop calculation (System length= L):

- Power supply in one extreme= L/1
- Power supply in the centre= L/2
- Power supply in both extremes= L/4
- Power supply at 1/6 from each extreme= L/6

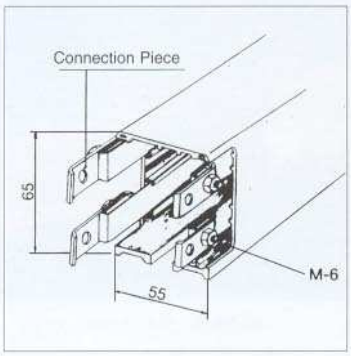
The value of L is reduced when the width of the mobile machine is considered.
The system length includes the feeding track length + feeding cable length.

LM ASSEMBLY

Composed of modular housing (ref. PEM), with connections, joints (ref. EMP-4) and sliding hangers (ref. SO-4).

Ref. LM-40	until	40 A	Modular housing	+	Joints	+	Sliding hangers/2 m	+	Connections
Ref. LM-60	until	60 A	"	"	+	"	+	"	+	"
Ref. LM-80	until	80 A	"	"	+	"	+	"	+	"
Ref. LM-100	until	100 A	"	"	+	"	+	"	+	"
Ref. LM-140	until	140 A	"	"	+	"	+	Sliding hangers/1'33 m	+	"

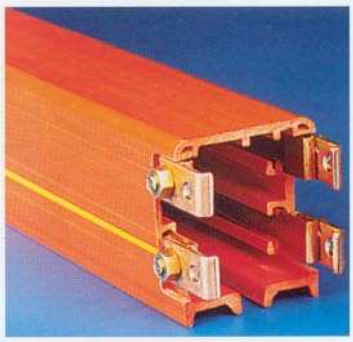
For aggressive environments or outdoor installations, the connections are treated with cadmium, the screws are made of stainless steel and the sliding hangers are galvanized and epoxy-coated. In these cases the system references are LM-40E, LM-60E, LM-80E, LM-100E and LM-140E.



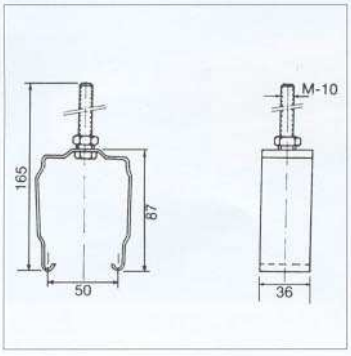
MODULAR HOUSING

Refs. PEM-40, PEM-60, PEM-80, PEM-100 and PEM-140. PVC housing in 4 m. modules with conductors and incorporated connection systems. The modules are supplied in shorter lengths for completing longer installations. For outdoor systems or aggressive environments the references are PEM-40E, PEM-60E, PEM-80E, PEM-100E and PEM-140E.

	PEM-40	PEM-60	PEM-80	PEM-100	PEM-140
WEIGHTS Kgs./m.	1,63	1,66	1,81	1,96	2,25



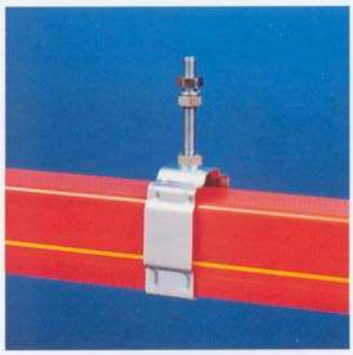
Ref. PEM-4



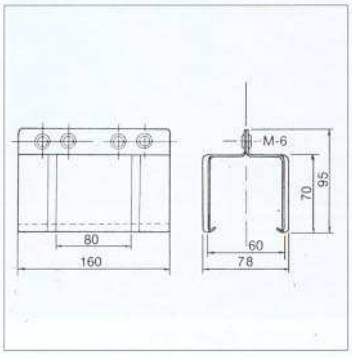
SLIDING HANGER Ref. SO-4

- In galvanized steel.
- Weight: 210 grms .
- The assembly allows sliding on the housing.

For outdoor systems or aggressive environments, with epoxy treatment and screws made of stainless steel. Ref. SO-4E.



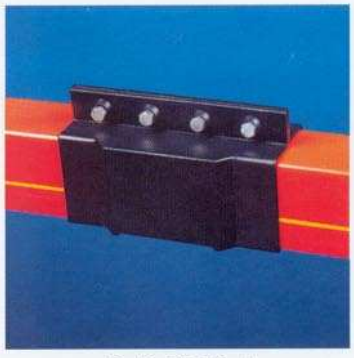
Ref. SO-4



JOINT Ref. EMP-4

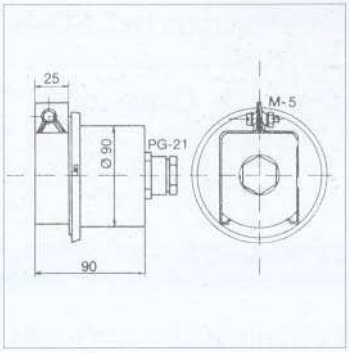
- In insulated material.
- Weight: 180 grms.
- The assembly allows sliding on the housing.

For outdoor systems or aggressive environments, with screws made of stainless steel. Ref. EMP-4E.



Ref. EMP-4

END FEED



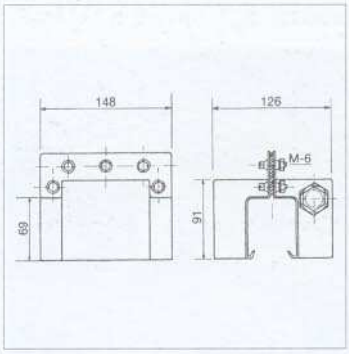
Ref. AE-4, AE-4-100 and AE-4-140

For connecting the power supply to the line at one end of the system.

- In insulated material.
- Weight: 280 grms.
- Incorporates the housing connections.
- Cable entry via a cable gland:
  - 1pc. PG-21 for LM-40 and LM-60..... Ref. AE-4
  - 1pc. PG-29 for LM-80 and LM-100..... Ref. AE-4-100
  - 1pc. PG-36 for LM-140..... Ref. AE-4-140
- For outdoor systems or aggressive environments Ref. AE-4E


Ref. AE-4

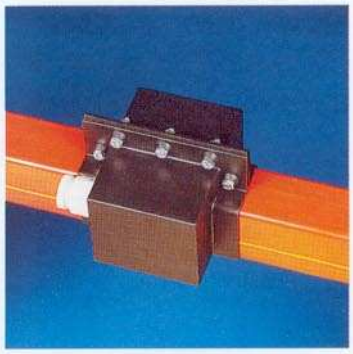
LINE FEED



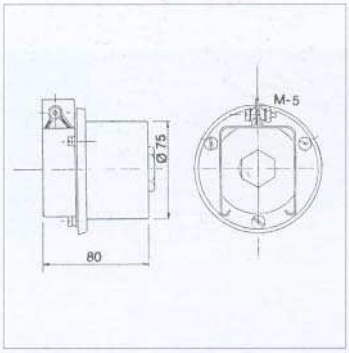
Ref. AI-4, AI-4-100 and AI-4-140

For connecting the power supply at any position along the length of the system.

- In insulated material.
- Weight: 350 grms.
- With housing connections which envelope the conductor connections.
- Cable entry via cable glands:
  - 1pc. PG-21 for LM-40 and LM-60..... Ref. AI-4
  - 2pcs. PG-21 for LM-80 and LM-100..... Ref. AI-4-100
  - 4pcs. PG-21 for LM-140..... Ref. AI-4-140
- For outdoor systems or aggressive environments Ref. AI-4E


Ref. AI-4

END CAP

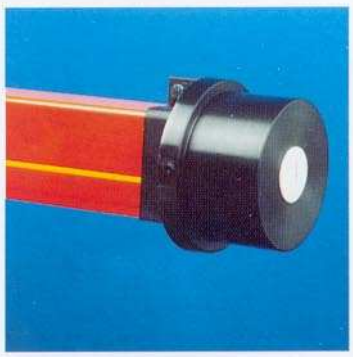


Ref. TE-4

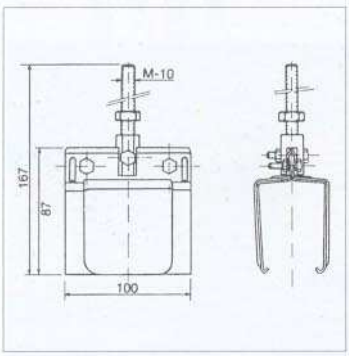
Acts as a security element protecting the ends of the system.

- In insulated material.
- Weight: 130 grms.

For outdoor systems or aggressive environments Ref. TE-4E.


Ref. TE-4

FIXED POINT CLAMP

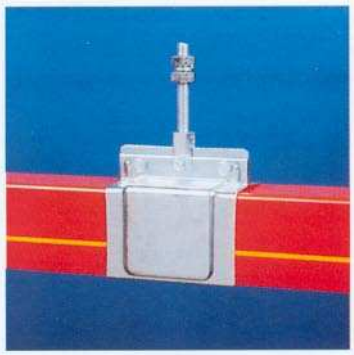


Ref. PF-4

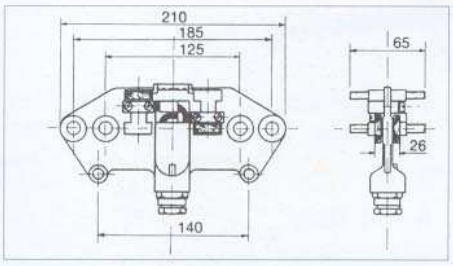
Necessary to avoid total movement of the system and for allowing free expansion to both ends.

- It is recommended that they are installed in the centre of the system.
- In galvanized steel.
- Weight: 400 grms.

For outdoor systems or aggressive environments, with epoxy treatment and screws made of stainless steel. Ref. PF-4E.


Ref. PF-4

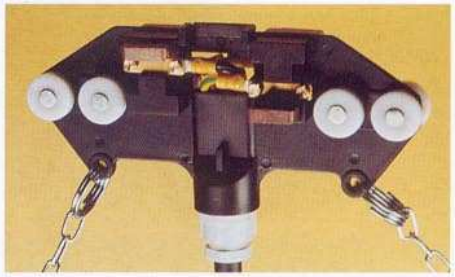
CURRENT COLLECTOR TROLLEY



Ref. TO-4x35 A

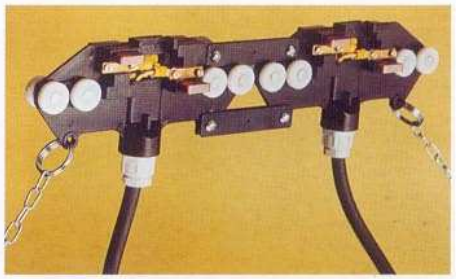
References :

TO-4x35A ..... Single trolley 35 Amps
TO-4x70A ..... Double trolley 70 Amps
TO-4x35AC ..... Trolley for curves 35 Amps
TO-4x70AC ..... Trolley for curves 70 Amps



Ref. TO-4x35 A

- Insulated support.
- Ball bearings.
- Weight TO-4x35A : 950 grms.
- Provided with 2m of extra-flexible 4x4 mm² cable.
- Cable gland PG-16.
- Spring loaded carbon brushes, 24x7x22 mm in N51 quality. (ref. ETO-4).

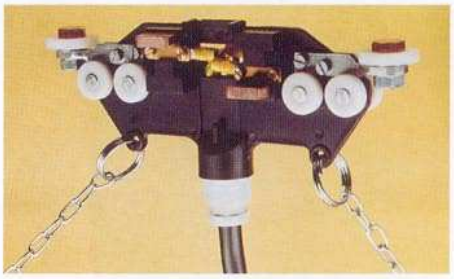


Ref. TO-4x70 A

For installations with transfer guides, they have precision travel with superior bearings. In these cases ref. TO-4x35ATR, it requires an elastic towing arm ref. BA-4TR. To ensure power supply to the mobile equipments at least two trolleys must be installed.

Max. speeds in m/min :

TO-4x35A 160m/min
TO-4x35AC and TO-4-35ATR 90m/min
TO-4x70A 130m/min
TO-4x70AC and TO-4-70ATR 70m/min

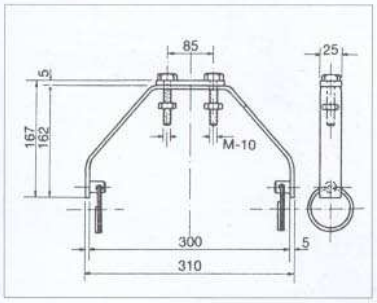


Ref. TO-4x35 AC

For inspection of the current collector trolley or replacing the carbon brushes, disconnect the power supply and remove the trolley from the end of the system or with assistance, unfasten the joints and loosely separate the sections.

TOWING ARM

Provides traction on the current collector trolley for its movement in the system.



Ref. BA-4

Ref. BA-4. Single arm for trolley TO-4x35A and TO-4x35AC.
Ref. BA-4C. Single arm with connection box.
Ref. BA-70 Double arm with connection box for double trolley TO-4x70A.
Ref. BA-TR Elastic for installation with transfer guides.

- In epoxy coated steel.
- Weight BA-4 : 780 grms.

Ref. BA-4

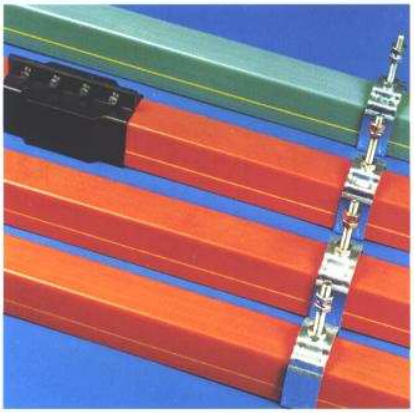
Ref. BA-4C

Ref. BA-70

SPECIAL INSTALLATIONS

- For system lengths in excess of 280m. and with temperature differences > of 40°C , please, consult our Technical Service .

- Systems working with curves : Indicate the radius and degrees, provide a sketch and service conditions. The minimum radius for horizontal or vertical curves is 1 m.

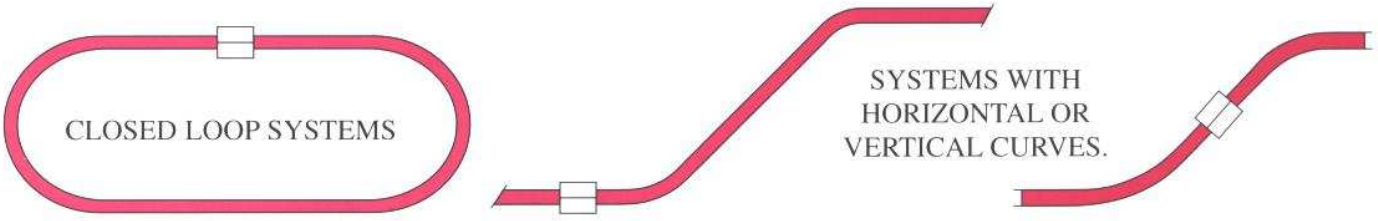


- Systems which require intensities greater than 140 Amps, or with more than 4 poles, they will require an assembly of various housings in parallel.

- Systems with diversions or mixed systems of outdoor or indoor, they will be of ancillary component applications. Consult our Technical Services.

- Installations with aggressive ambients of humidity, acidity, temperatures or others, please consult.

EXAMPLE SKETCHES:



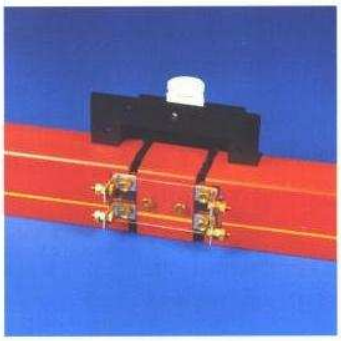
ISOLATION POINT

Ref. SC-4

Designed for voluntarily interrupting the flow of electric current in a determinated section of the system.

They are supplied to be connected between 2 housing modules.

Total lenght: 1 m.



Ref. SC-4

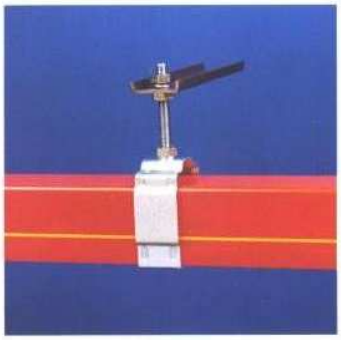
WELDED SUPPORT

Ref. SSL-150

Ref. SSL-150 (of length 150 mm.)
SSL-200 (of length 200 mm.)
SSP-170 (of length 170 mm.)

The standard element to be welded onto metallic structures, for installing sliding hangers Ref. SO-4 and fixed point clamp PF-4.

Provided with a hole in order to allow correct aligment.
In painted steel.



Ref. SSP-170

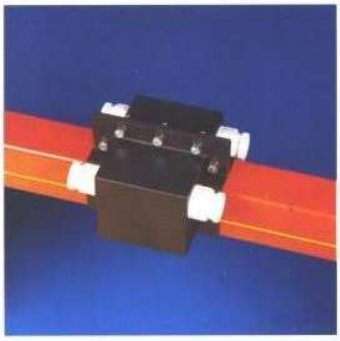
HOUSING VENTILATION

Ref. EV-4

To provide air ventilation in the assembly, between two modular sections.

This is necessary to allow the exit of air from the interior of the system, preventing possible condensation. This is used in installations with different temperature changes, for example, systems with mixed zones of indoor and outdoor.

The component EV-4 must be mounted at the border of these different temperature zones with the housing ventilation on the outside.
The modular section is pre-prepared to allow connection to other sections.



Ref. EV-4

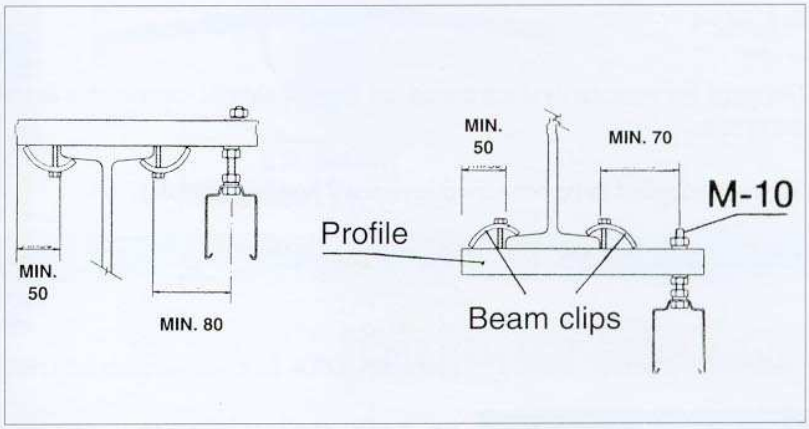
UNIVERSAL SUPPORT

Ref. SU-(Length)

In galvanized steel material. To be installed to support the sliding hangers in the structure. To avoid welding and to allow correct alignment. Useable for cases of moving or reinstallation of the system.

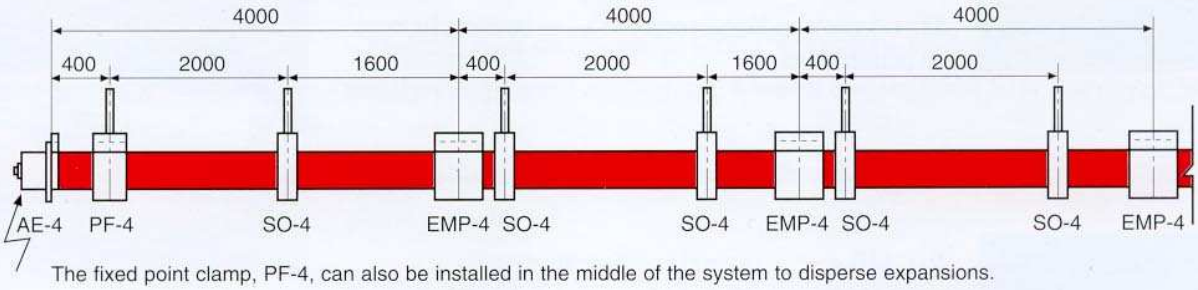
Composed of 2 beam clips and profile with a hole of Ø10 mm. Prior to ordering, determine the total length of the profile.

Example: SU-500 (with a profile length of 500 mm)



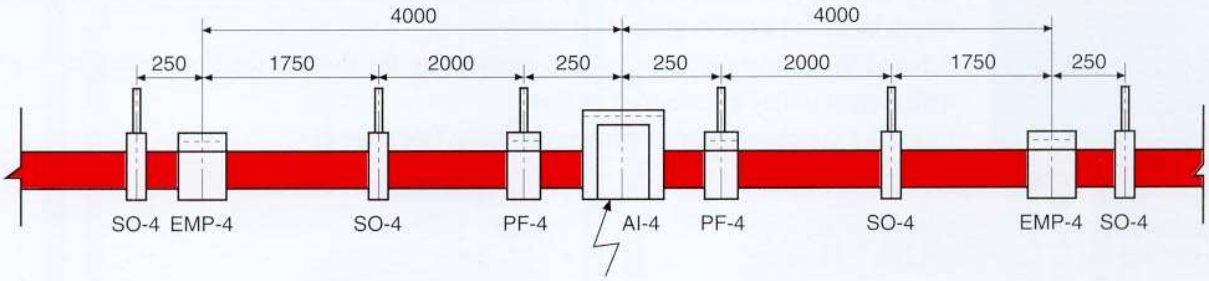
LM-4 MOUNTING DIAGRAMS

INDOOR SYSTEM WITH END FEED (Sliding hangers every 2 metres)

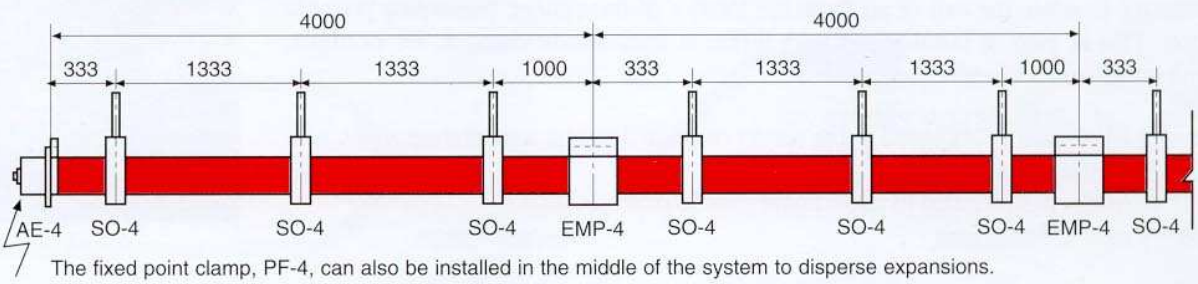


The fixed point clamp, PF-4, can also be installed in the middle of the system to disperse expansions.

INDOOR SYSTEM WITH LINE FEED (Sliding hangers every 2 metres)



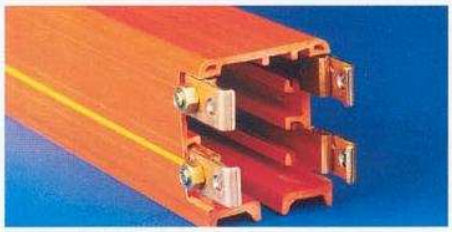
OUTDOOR SYSTEM WITH END FEED (Sliding hangers every 1,33 metres)



The fixed point clamp, PF-4, can also be installed in the middle of the system to disperse expansions.

1.° Install welded supports, or other type, in order to fix sliding hangers (SO-4) and fixed point clamp (PF-4), according to the mounting sketch.

2.° Installation of the LM-4 track, paying attention to the guide position, with the yellow strip signalling "Earth" always on the same side.The modules all must remain in the same position.



3.° Connection of the conductors. Different lengths of insulated profile and the conductors, made to length during manufacture, the connections allow suitable expansion in the PVC.

Cover the connections with joint ref. EMP-4, fitting into the lower slot of the profile.

It is advantageous to make the steps 1, 2 and 3 in lengths of 8 - 12 metres.

4.° After having assembled the complete track, attach the end feed, or line feed, and the end cap where appropriate.

For added security, the power feed connections can be covered with insulated adhesive tape.

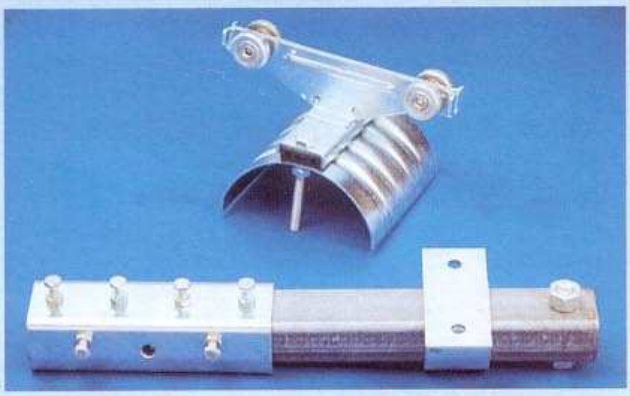
5.° Insert the current collector trolley (with manual pressure to the brushes), into the modular section keeping them in the correct slot to avoid crossing the phases.

6.° Mount the towing arm, aligning the chain shaft with the central axis of the modular section. Connecting to the electrical terminal. The cable from the current collector trolley has to join the towing arm forming a loop, without causing torsion in the current collector.

7.° Connect to the main power supply and complete Isolation and Working tests.

Manufacturing Programme

- Flexible energy supply systems through cable trolleys.
- Multipole insulated conductor systems.
- Equipments for contact electrical systems.
- Insulators, moulded pieces and special formed pieces for the industry.
- Cable glands.
- Cables: flat and round cables in PVC and NEOPRENE.
- Cable reels.



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