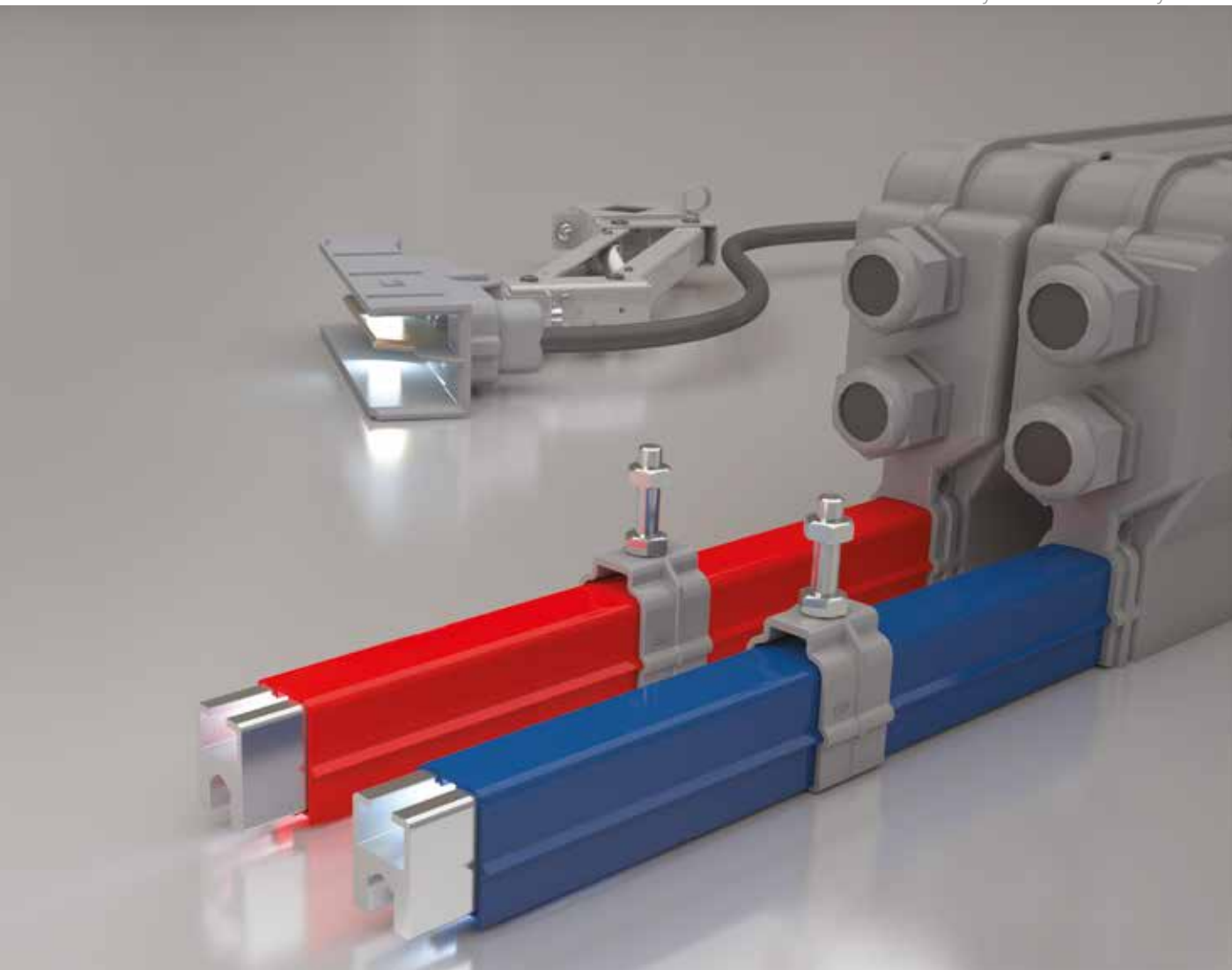




# E-LINEURC

Dynamic Busbar Systems



# E-LINEURC





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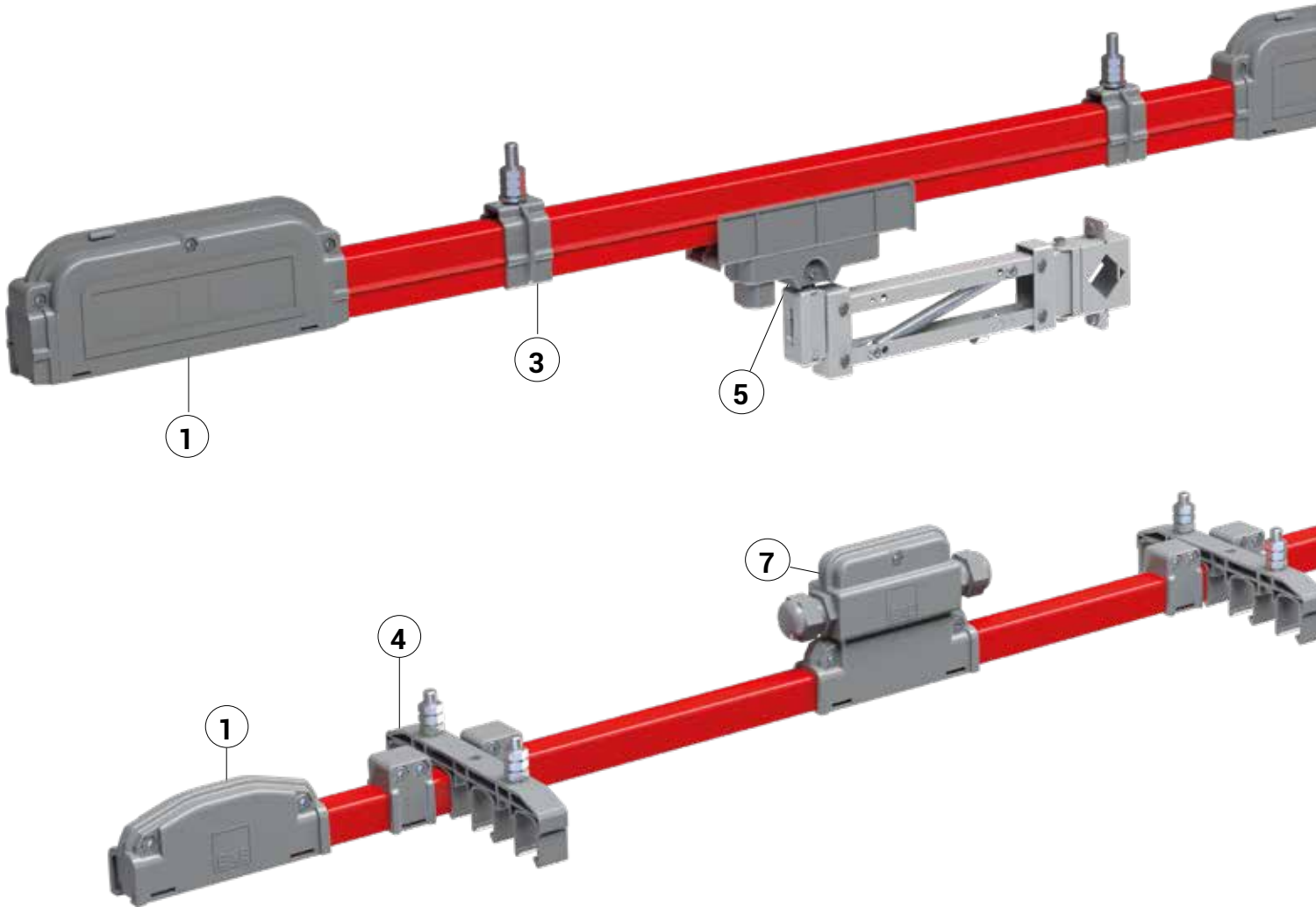
The E-Line URC range is designed to supply continuous power to moving machines. The system is easy to install and can be used in both indoor and outdoor installations. The E-Line URC system offers a safe solution for long runs because there are no moving cables. This eliminates the possibility of accidents and malfunctions associated with moving cables.

**Standard Length:** 4m (Copper and Galvanized Steel Conductor URC)  
6m (Aluminium Conductor URC)

**Operating Speed:** Maximum 200m/min.

### System Components:

The E-Line URC comprises an end feed unit which supplies power to the conductors which are manufactured from either, copper, galvanised steel or aluminium with stainless steel contact surface. The power is conducted to the machine through a moving collector which runs along the length of the conductors. An expansion unit protects the installed system from external mechanical stresses. End caps are fitted to each end of the busbar run to safely complete the installation. The system is supported by sliding hangars.

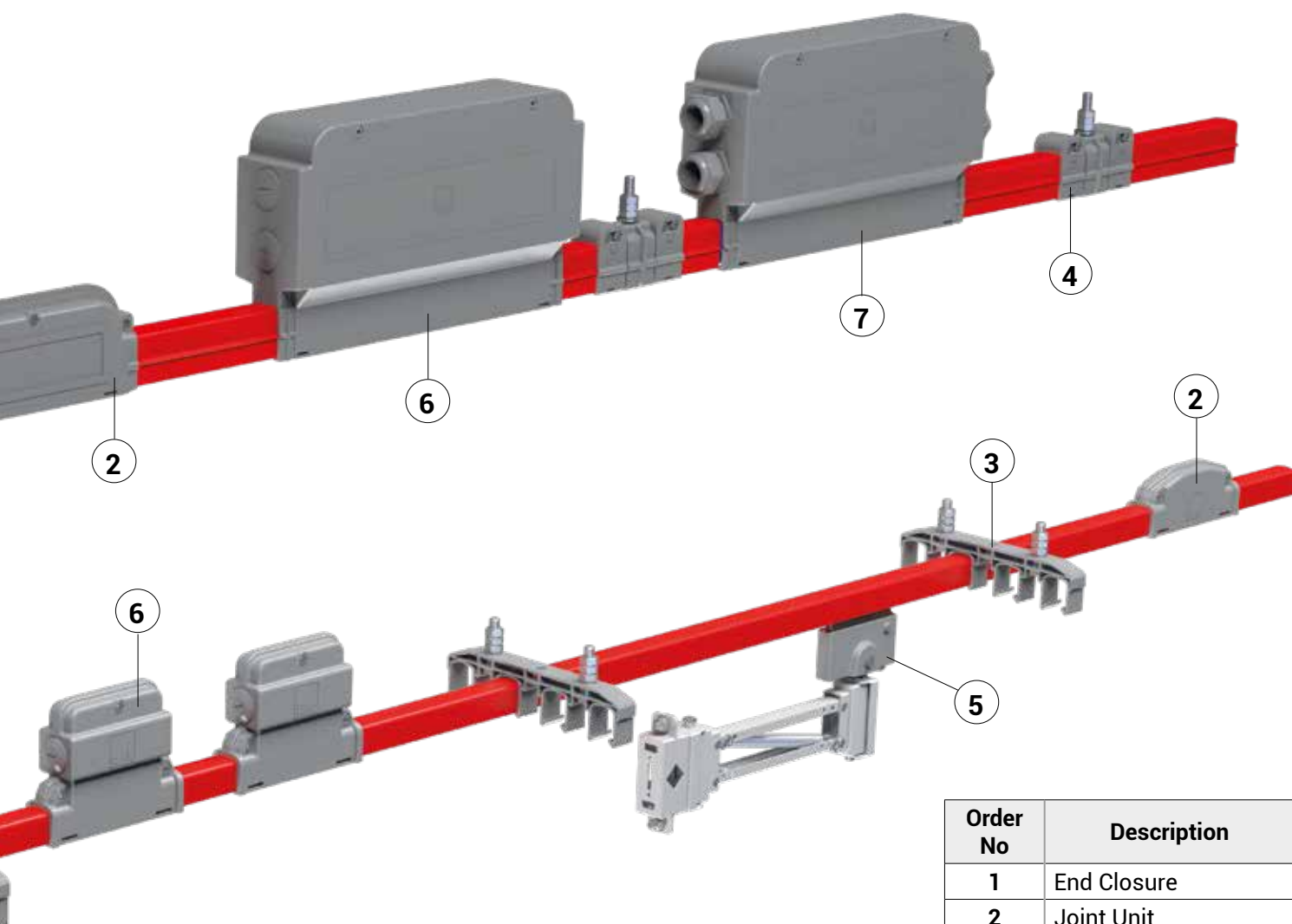


### Personnel Safety:

- Personnel safety is assured by the insulation of the conductors.
- Protection Degree is IP23.

**Safety:**

- The E-Line URC system offers a safe solution for long runs because there are no moving cables.
- This eliminates the possibility of accidents and malfunctions associated with moving cables.
- The system can be used safely for outdoor applications, the component materials used give a long life solution.



Order No	Description
1	End Closure
2	Joint Unit
3	Sliding Hanger
4	Fixing Unit
5	Current Collector
6	Expansion Module
7	Feeder Unit

**Functionality:**

- The system has a long life. On higher current versions the conductors are aluminium with a stainless steel V conductor surface.
- The system can carry serial collectors to allow for more than one machine to be fed from the same busbar.

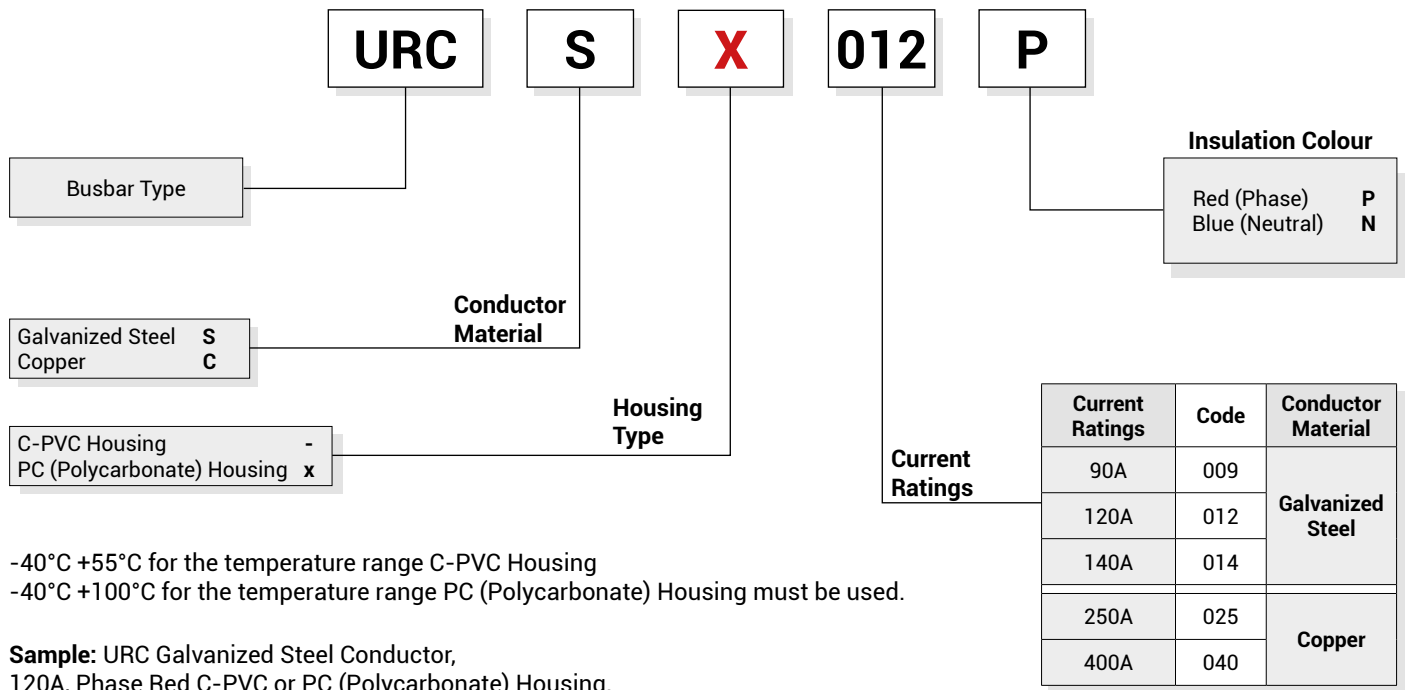
### Dynamic Busbar Systems:

The E-Line URC range is designed to supply continuous power to moving machines. The E-Line URC system offers a safe solution for long runs. The system is easy to install and can be used in both indoor and outdoor installations.

### Applications

- Port, construction and cranes
- AS/RS storage systems
- Moving playground systems
- Moving Ceiling and Door Systems
- Assembly and test lines
- Monorail systems
- Elevator and lift systems





## ►► Technical Features

### Galvanized Steel

Rated Current	(A)	90	120	140
Conductor Cross-section Area	(mm <sup>2</sup> )	52	64	96
Rated Voltage	(AC) (V)	1000	1000	1000
Resistance (20°C)	R <sub>20</sub> (mΩ/m)	2,221	2,280	1,586
Resistance (35°C)	R <sub>35</sub> (mΩ/m)	2,598	2,878	1,952
Reaktance	X (mΩ/m)	0,580	0,591	0,736
Impedance	Z (mΩ/m)	2,662	2,938	2,086

### Copper

Rated Current	(A)	250	400
Conductor Cross-section Area	(mm <sup>2</sup> )	64	96
Rated Voltage	(AC) (V)	1000	1000
Resistance (20°C)	R <sub>20</sub> (mΩ/m)	0,287	0,185
Resistance (35°C)	R <sub>35</sub> (mΩ/m)	0,333	0,233
Reaktance	X (mΩ/m)	0,125	0,125
Impedance	Z (mΩ/m)	0,356	0,264

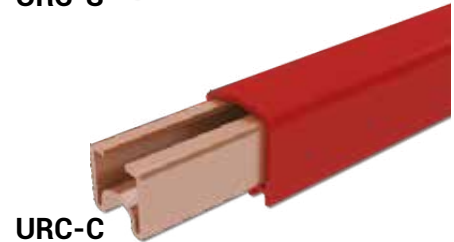


Galvanized Steel Conductor	C-PVC Housing (-40°C +55°C)		PC(Polycarbonate)Housing (-40°C +100°C)	
	URC-S		URC-SX	
	Phase	Neutral	Phase	Neutral
URC 009 (90A)	3034540	3034541	3179671	3179670
URC 012 (125A)	3034542	3034543	3179673	3179672
URC 014 (140A)	3034544	3034545	3179675	3179674

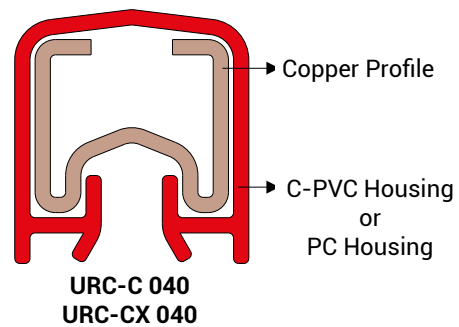
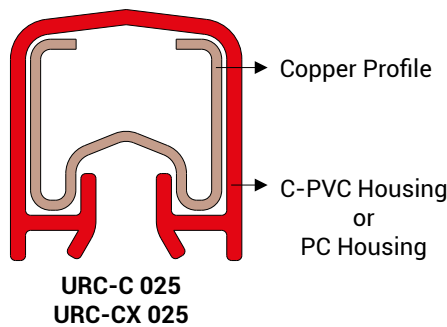
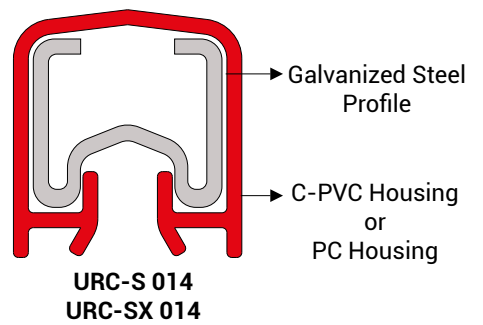
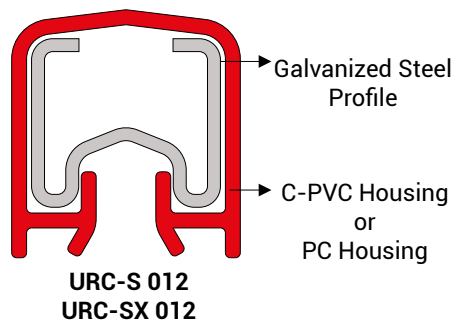
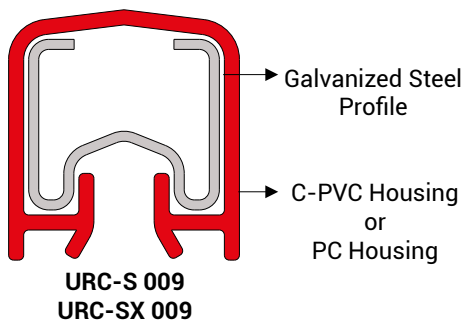


URC-S

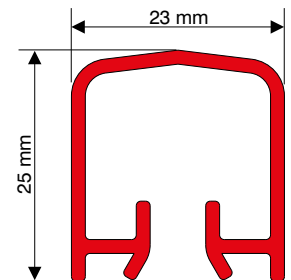
Copper Conductor	URC-C		URC-CX	
	Phase	Neutral	Phase	Neutral
URC 025 (250A)	3034546	3034547	3179663	3179662
URC 040 (400A)	3034548	3034549	3179665	3179664



URC-C



	Cross- Section Area	Weight	Current (Continious)
URC-S / URC-SX 009	52 mm <sup>2</sup>	0,65kg/m	90A
URC-S / URC-SX 012	64 mm <sup>2</sup>	0,70kg/m	120A
URC-S / URC-SX 014	96 mm <sup>2</sup>	0,90kg/m	140A
URC-C / URC-CX 025	64 mm <sup>2</sup>	0,76kg/m	250A
URC-C / URC-CX 040	96 mm <sup>2</sup>	1,00kg/m	400A



### Technical Features :

- Galvanized Steel or Copper Conductors,
- Protection Degree IP23
- Standard length is 4m.

- Ambient temperature is :
  - (-40°C +55°C) for C-PVC housing,
  - (-40°C +100°C) is for PC housing,

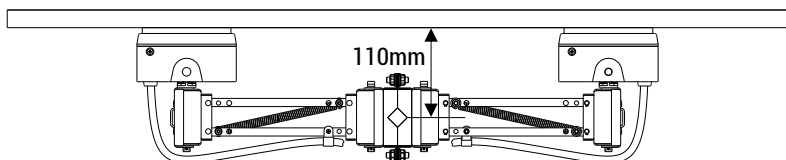


### URC-C / URC-S Current Collector

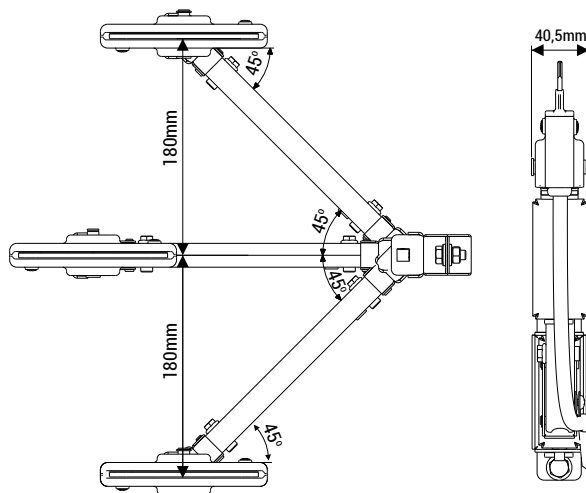
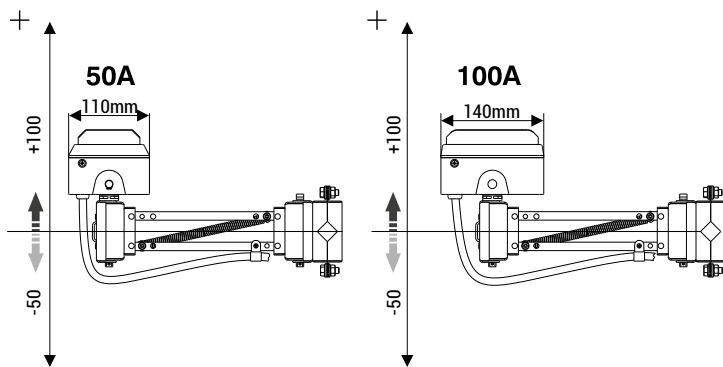
Description	Order Code
URC-C/S 50A Current Collector - (Y)	3233906
URC-C/S 100A Current Collector - (Y)	3233907

#### URC-C / URC-S Technical Features :

- Copper-Graphite Brush
- 200m/min. maximum operating speed
- 50A 1x10mm<sup>2</sup> H01N2-D 2m standard cable length
- 100A 1x16mm<sup>2</sup> H01N2-D 2m standard cable length

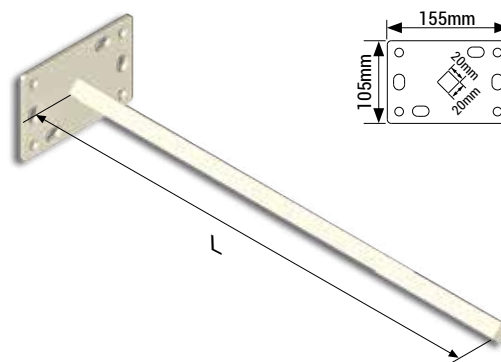
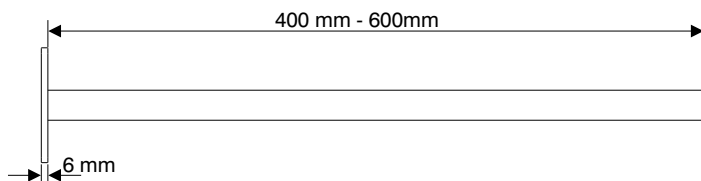


- The distance between busbar and current collectors support should be 110mm.
- The contact pressure of current collector is 10N.



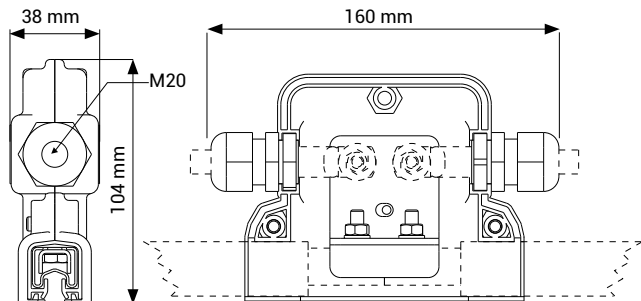
### URC-C / URC-S Current Collectors Support

Description	Order Code
URC-C/S Current Collectors Support (400mm)	3034551
URC-C/S Current Collectors Support (600mm)	3188390



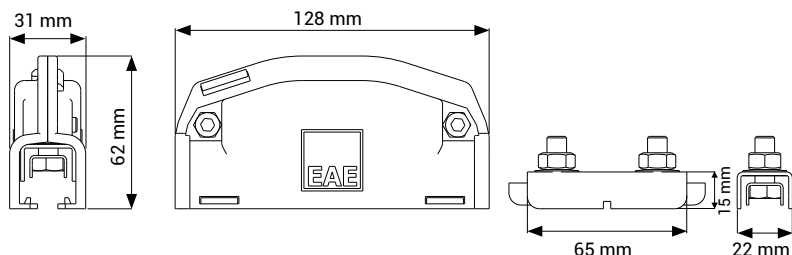
### URC-C / URC-S Feeder Units

Description	Order Code
URC-C/S Feeder Unit	3034552



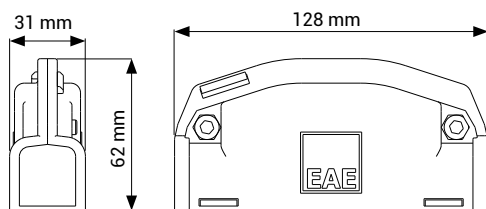
### URC-C / URC-S Joint Unit

Description	Order Code
URC-C Joint Unit	3034582
URC-S Joint Unit	3034557



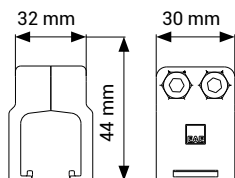
### URC-C / URC-S End Closure

Description	Order Code
URC-C/S End Closure	3034571



### URC-C / URC-S Fixing Unit

Description	Order Code
URC-C/S Fixing Unit	3034581



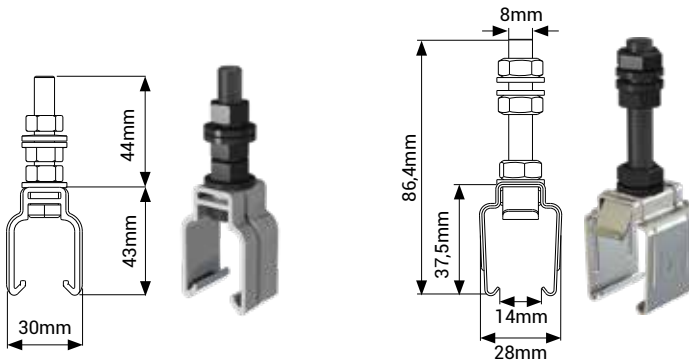
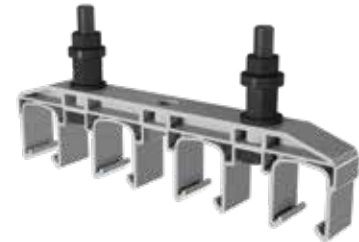
### URC-C / URC-S Current Collector Brush Set

Description	Order Code
URC-C/S Current Collector Brush Set (50A)	3158599
URC-C/S Current Collector Brush Set (100A)	3158598



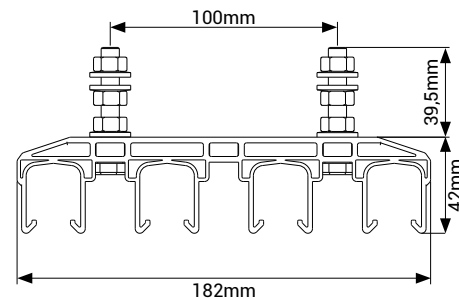
### URC-C / URC-S Sliding Hanger

Description	Order Code
URC-C/S Plastic Sliding Hanger (Single)	3034558
URC-C/S Plastic Sliding Hanger (Quad)	3034559
URC-C/S Steel Sliding Hanger (Single)	3200541



Plastic Sliding Hanger (Single)

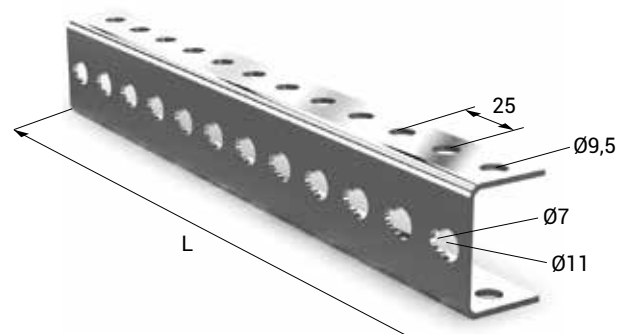
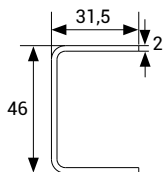
Steel Sliding Hanger (Single)



Plastic Sliding Hanger (Quad)

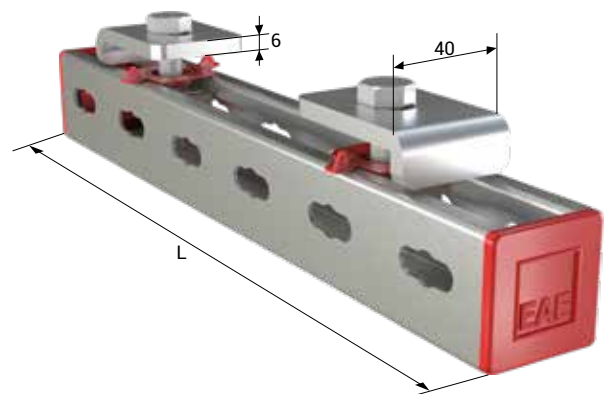
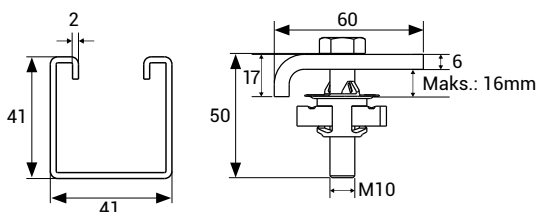
### URC-C / URC-S Hanger Bracket

Description	Order Code
URC-C/S Hanger Bracket (500mm)	3034560
URC-A Hanger Bracket (750mm)	3025382



### URC-C / URC-S BR Hanger Bracket Set

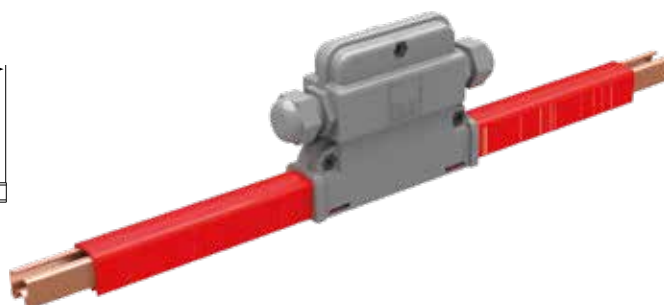
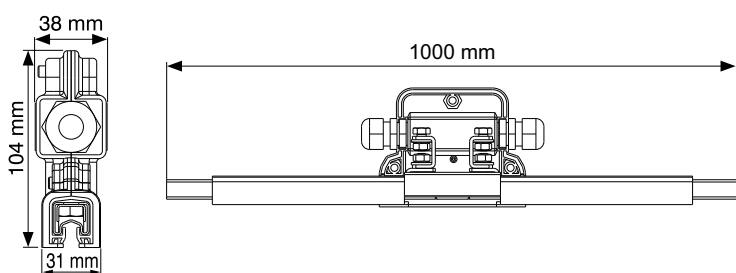
Description	Order Code
URC-C/S BR Hanger Bracket Set (600mm)	3178917
URC-A BR Hanger Bracket Set (800mm)	3178918



### URC-C / URC-S Repair Zone Module

Galvanized Steel Conductor	C-PVC Housing (-40°C +55°C)		PC (Polycarbonate) Housing (-40°C +100°C)	
	URC-S		URC-SX	
	Phase	Neutral	Phase	Neutral
URC Repair Zone Module	3055995	3055996	3179745	3179746

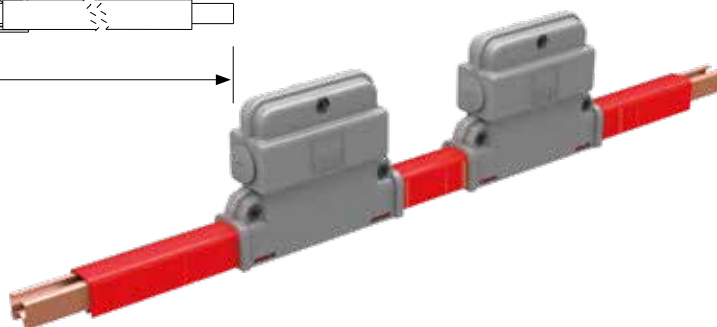
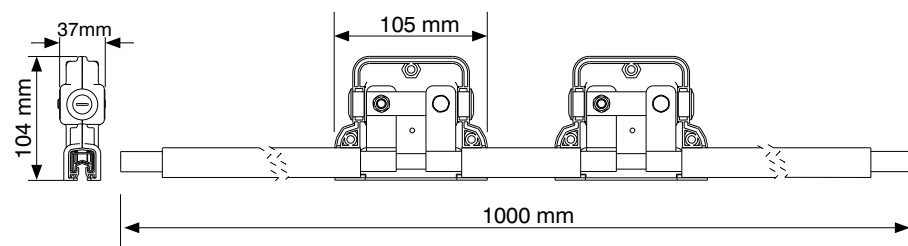
Copper Conductor	URC-C		URC-CX	
	Phase	Neutral	Phase	Neutral
URC Repair Zone Module	3055993	3055994	3179743	3179744



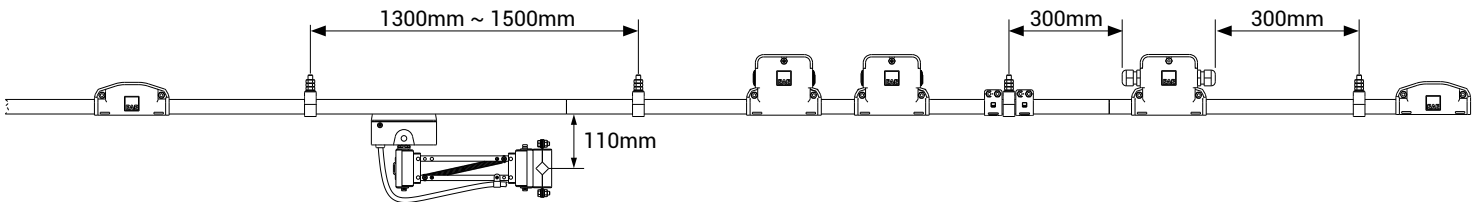
### URC-C / URC-S Expansion Module

Galvanized Steel Conductor	C-PVC Housing (-40°C +55°C)		PC (Polycarbonate) Housing (-40°C +100°C)	
	URC-S		URC-SX	
	Phase	Neutral	Phase	Neutral
URC 009 Expansion Module (90A)	3034561	3034562	3179677	3179676
URC 012 Expansion Module (120A)	3034563	3034564	3179679	3179678
URC 014 Expansion Module (140A)	3034565	3034566	3179681	3179680

Copper Conductor	URC-C		URC-CX	
	Phase	Neutral	Phase	Neutral
URC 025 Expansion Module (250A)	3034567	3034568	3179667	3179666
URC 040 Expansion Module (400A)	3034569	3034570	3179669	3179668

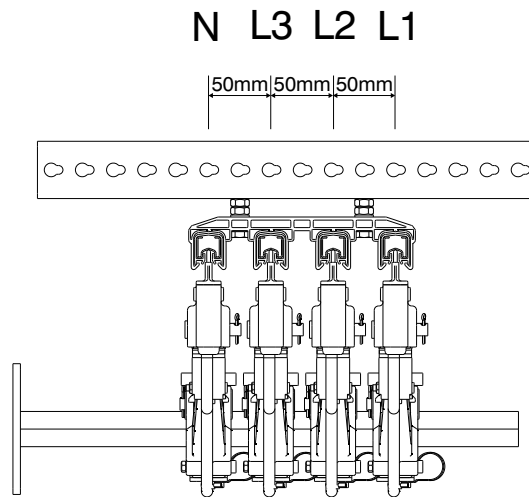
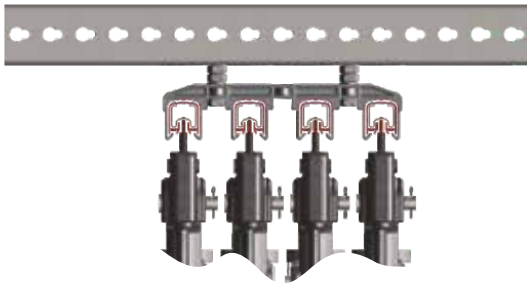


The expansion module should be used every 50 meters between the fixed points in order to protect the system from being damaged by the expansion that may occur due to heat.



- Distance between the sliding hangers should be **1300 ~ 1500mm**.
- Distance between Feeder Units and other units should be minimum **300mm**.

### Installation



For horizontal installation distance at least **50mm** ,should be between sliding hanger axes.

The voltage drop in the busbar lines shall be inspected as per the busbar type selected according to the total current calculated based on the ambient temperature and operating period of the system. Maximum acceptable value for voltage drop is 3%.

**For Direct Current**

$$\Delta U = 2 \cdot L_t \cdot I_G \cdot R$$

$\Delta U$  = Voltage Drop [V]

**For Mono-Phase Alternative Current**

$$\Delta U = 2 \cdot L_t \cdot I_G \cdot Z$$

$I_G$  = Total current [A]

$R$  = Resistance of the busbar [ $\Omega/m$ ]

**For Three-Phase Alternative Current**

$$\Delta U = \sqrt{3} \cdot L_t \cdot I_G \cdot Z$$

$Z$  = Impedance of the busbar [ $\Omega/m$ ]

$L_t$  = Calculated Hole Length [m]

**Note :** Calculation of the current drawn during first start in various motor types;

$I$  = Total current drawn in the first start of the motors [A]

For the starting current; Three-phase asynchronous drive in direct start

$$I_A = I_G \times \text{calculated as 5 to 6}$$

Slip ring rotor motor

$$I_A = I_G \times \text{calculated as 2 to 3}$$

Frequency converter

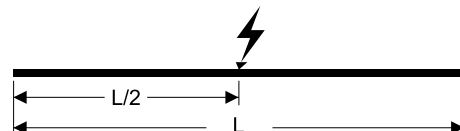
$$I_A = I_G \times 1,20 \text{ to } 1,50 \text{ calculated between.}$$

### ►► CALCULATION OF FEEDING POINTS

When we take L as the length of the line, feeding points may be selected as shown in the diagrams below to keep the L voltage drop at minimum and it may be used as the hole length for the calculation of L voltage drop.



1 feeding point from the start,  $L_t=L$



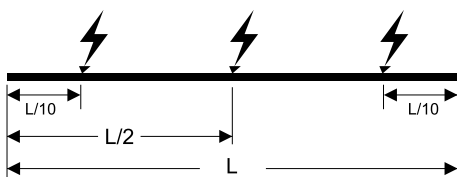
1 feeding point from the center,  $L_t=L/2$



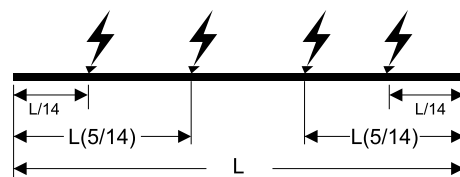
2 feeding points from the start points,  $L_t=L/4$



2 feeding points,  $L_t=L/6$

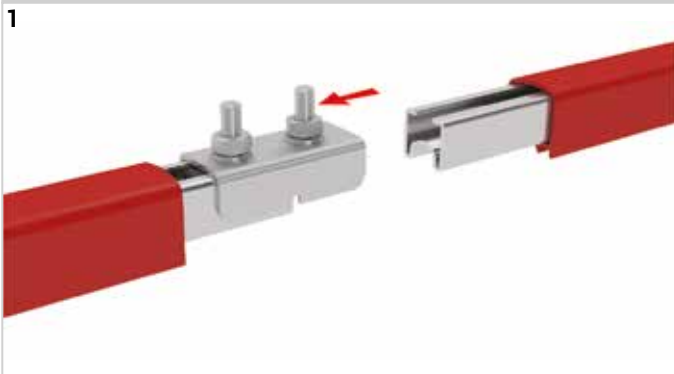


3 feeding points,  $L_t=L/10$

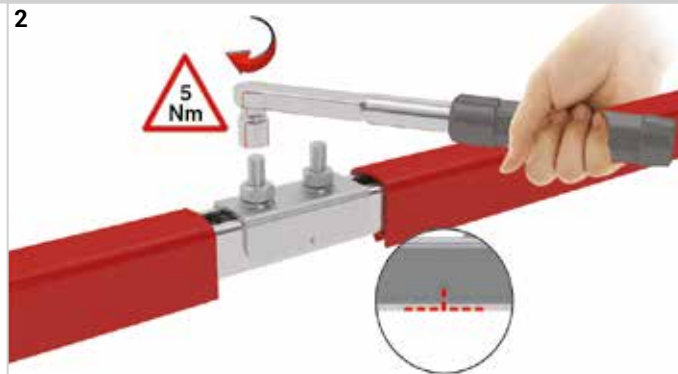


3 feeding points,  $L_t=L/14$

### URC-C / URC-S Joint Unit Installation Manual



Place the joint unit between the two busbar lengths to be joined with their bolts facing upwards as shown. The notch of the joint unit should be at the centre of the junction of the two Busbars.



Tighten the nuts with torque wrench adjusted to 5Nm.

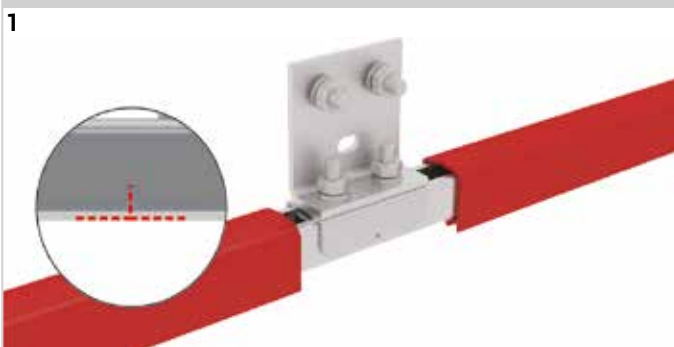


Place the joint unit covers facing each other.

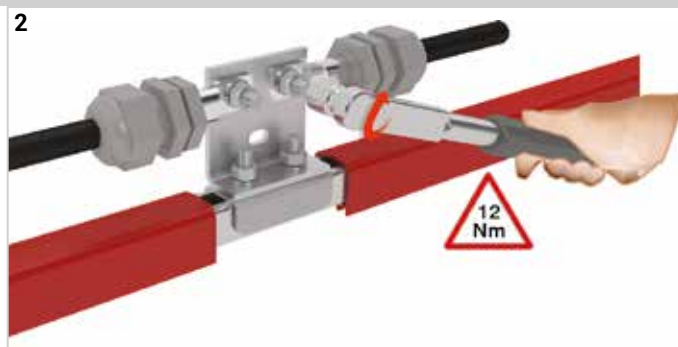


Tighten the the bolt with 5 allen wrench.

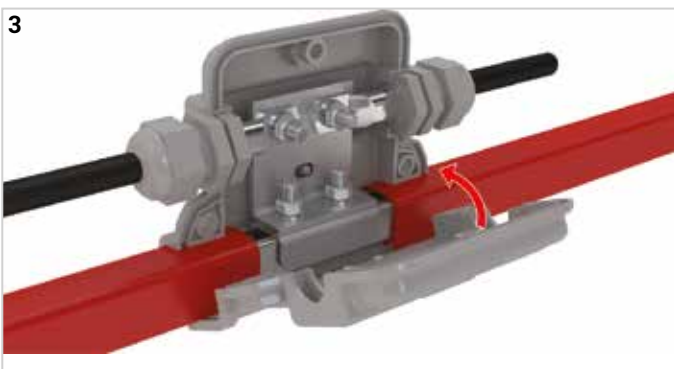
### URC-C / URC-S Feeder Unit Installation Manual



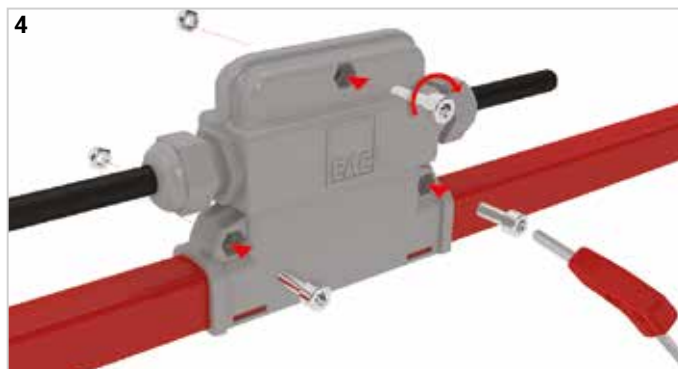
Place the joint unit between the two busbar lengths to be joined with their bolts facing upwards as shown. The notch of the joint unit should be at the centre of the junction of the two Busbars.



Pass the cables feeding the system through cable gland, tighten the nuts of the connecting plate with a torque wrench adjusted to 12Nm.



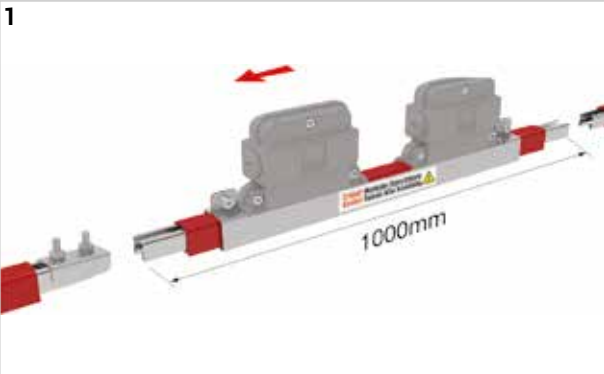
Place the feeder unit covers facing each other.



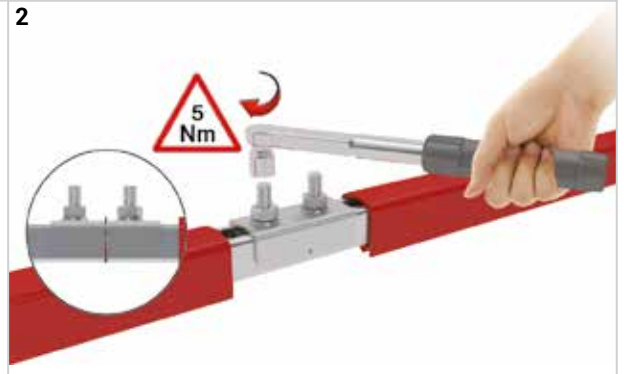
Put the bolts and nuts in the sockets. Tighten the the bolt with 5 allen wrench.



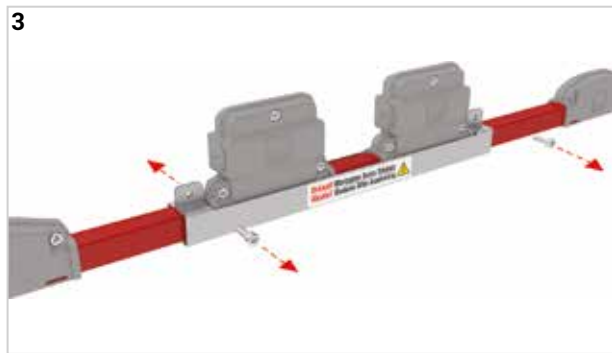
### URC-C / URC-S Expansion Unit Installation Manual



Please be sure that the expansion unit length is 1000mm. If the measured length is different from 1000mm, move the busbar forward or backward for adjustment. Place the joint unit between the two busbar lengths to be joined with their bolts facing upwards as shown.



The notch of the joint unit should be at the centre of the junction of the two Busbars. Tighten the nuts with torque wrench adjusted to 5Nm.

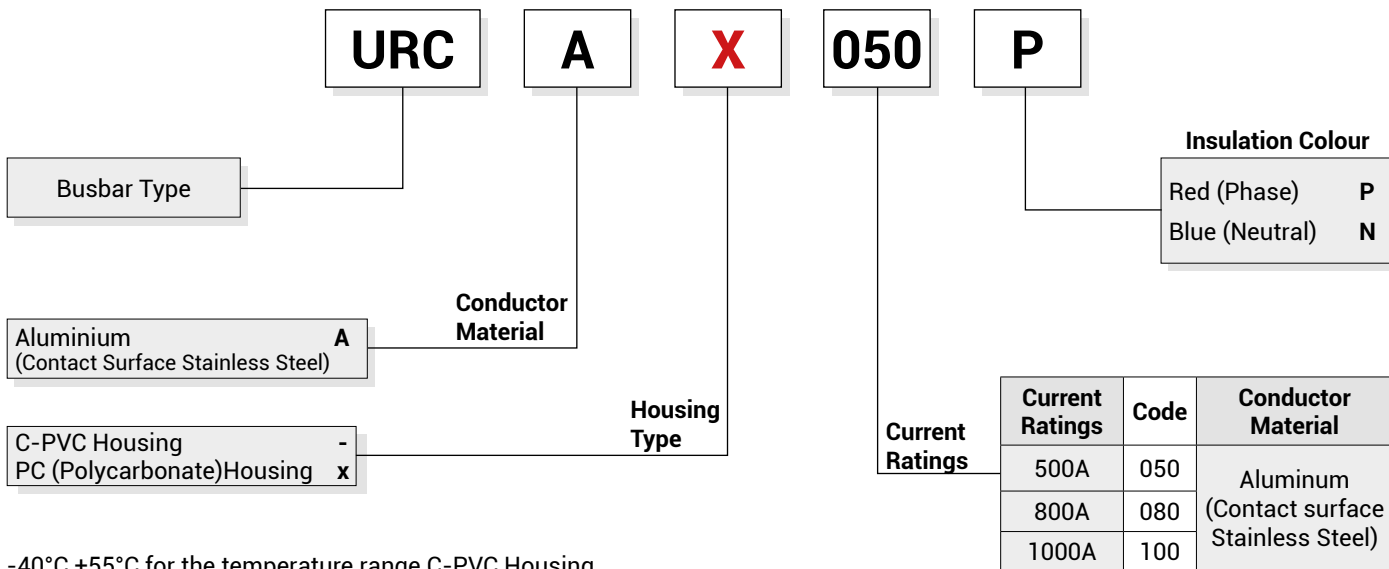


Remove the bolts of the steel alignment jig on the expansion unit.



Throw the steel alignment jig into the recycling bin.





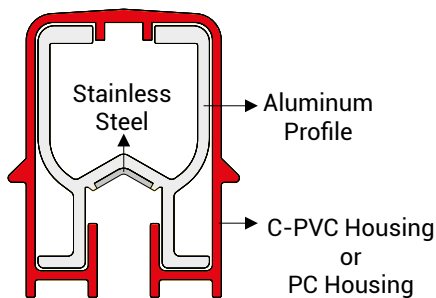
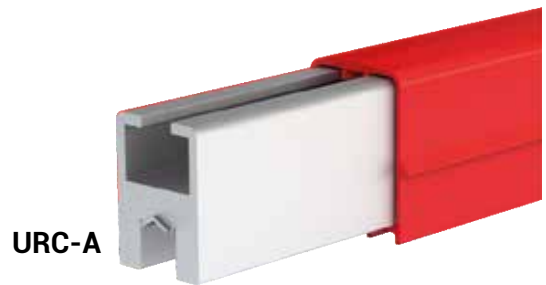
-40°C +55°C for the temperature range C-PVC Housing  
 -40°C +100°C for the temperature range PC (Polycarbonate) Housing must be used.

**Sample:** URC Aluminium & contact surface is Stainless Steel Conductor, 500A, Phase, Red C-PVC or PC (Polycarbonate) Housing

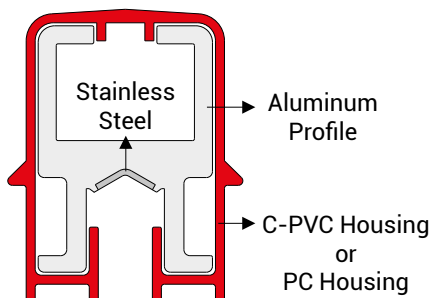
## ►► Technical Features

Rated Current	(A)	500	800	1000
Conductor Cross-section Area	(mm <sup>2</sup> )	275	460	625
Rated Voltage	(AC) (V)	1000	1000	1000
Resistance (20°C)	R <sub>20</sub> (mΩ/m)	0,128	0,078	0,059
Resistance (35°C)	R <sub>35</sub> (mΩ/m)	0,149	0,092	0,076
Reaktance	X (mΩ/m)	0,133	0,139	0,137
Impedance	Z (mΩ/m)	0,199	0,167	0,157

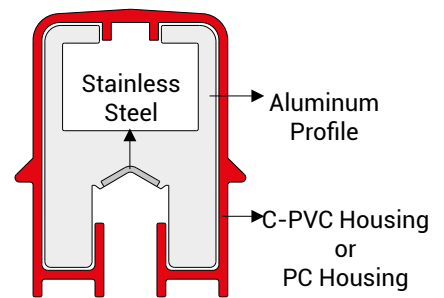
Aluminum Conductor	C-PVC Housing (-40°C +55°C)		PC (Polycarbonate) Housing (-40°C +100°C)	
	URC-A		URC-AX	
	Phase	Neutral	Phase	Neutral
URC 050 (500A)	3033991	3033992	3164914	3164913
URC 080 (800A)	3033993	3033994	3164916	3164915
URC 100 (1000A)	3033971	3033972	3164918	3164917



URC-A 050  
URC-AX 050

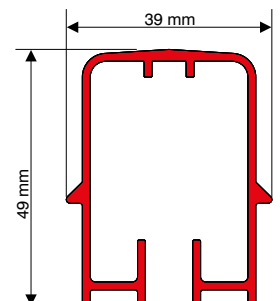


URC-A 080  
URC-AX 080



URC-A 100  
URC-AX 100

	Cross- Section Area	Weight	Current (Continuous)
URC-A / URC-AX 050	275mm <sup>2</sup>	1,15kg/m	500A
URC-A / URC-AX 080	460mm <sup>2</sup>	1,70kg/m	800A
URC-A / URC-AX 100	625mm <sup>2</sup>	2,05kg/m	1000A



### Technical Features :

- Aluminium Contact Surface Stainless Steel,
- Protection Degree IP23
- Standard length is 6m.

- Ambient temperature is :
  - C-PVC for housing -40°C +55°C
  - PC (Polycarbonate) is for housing, -40°C +100°C.

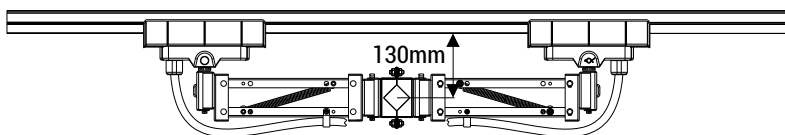
### URC Current Collector

Description	Order Code
URC-A 300A A Current Collector - (Y)	3233908
*URC-C/S 50A Current Collector - (Y)	3233906
*URC-C/S 100A Current Collector - (Y)	3233907

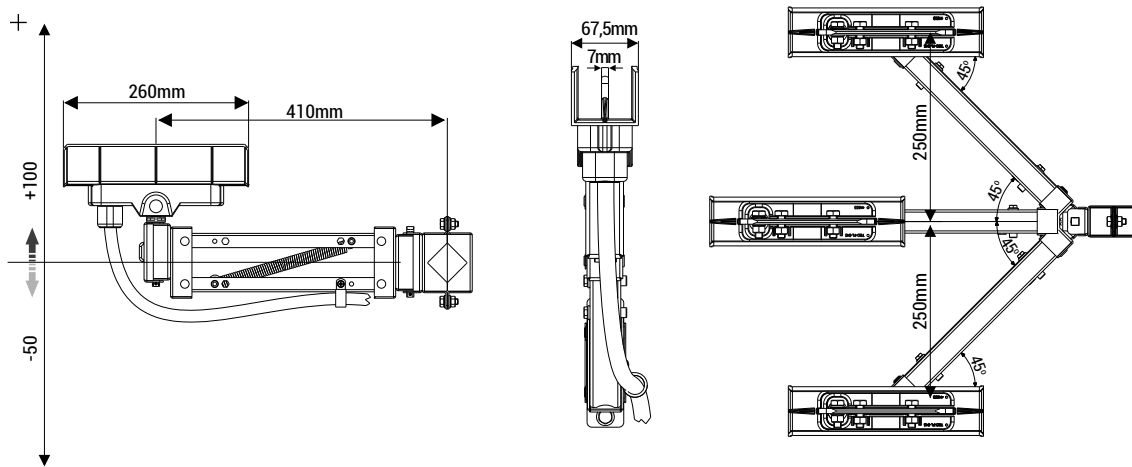
\* Technical details and product images see page 7.

#### URC-A Technical Features :

- Current collector capacity is 300A
- Copper-Graphite Brush
- 200m/min. maximum operating speed
- 1x95mm<sup>2</sup> H01N2-D 3m standard cable length.



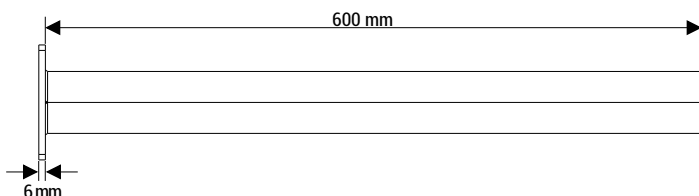
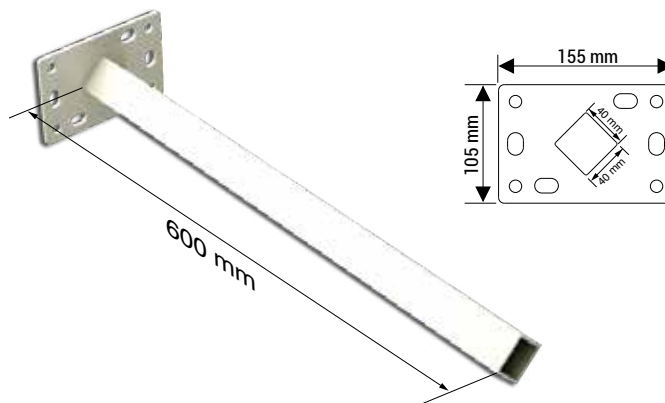
- The distance between busbar and current collectors support should be 130mm.
- The contact pressure of current collector is 50N.



### URC-A / URC-AX Current Collectors Support

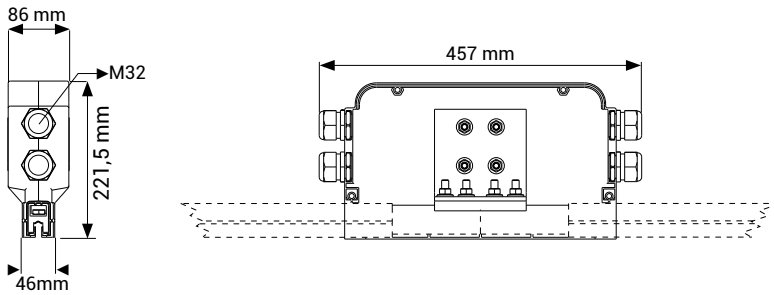
Description	Order Code
URC-A Current Collectors Support (600mm)	3030410
* URC-C/S Current Collectors Support (400mm)	3034551
* URC-C/S Current Collectors Support (600mm)	3188390

\* Technical details and product images see page 7.



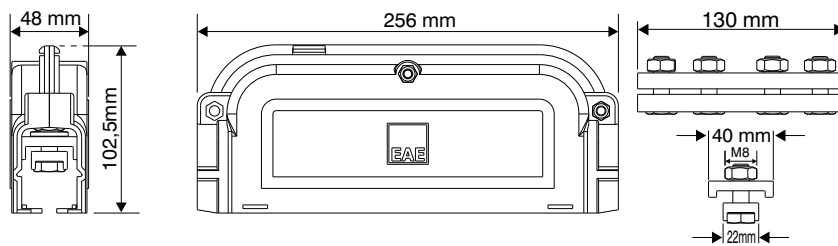
### URC-A / URC-AX Feeder Unit

Description	Order Code
URC-A Feeder Unit	3033990



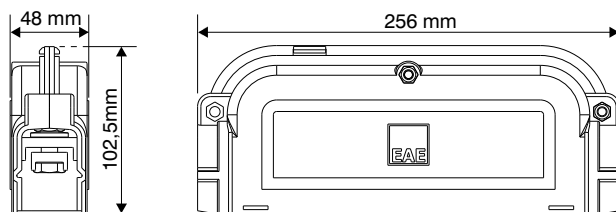
### URC-A / URC-AX Joint Unit

Description	Order Code
URC-A Joint Unit	3033995



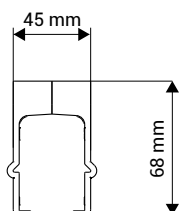
### URC-A / URC-AX End Closure

Description	Order Code
URC-A End Closure	3033977



### URC-A / URC-AX Fixing Unit

Description	Order Code
URC-A Fixing Unit	3033987



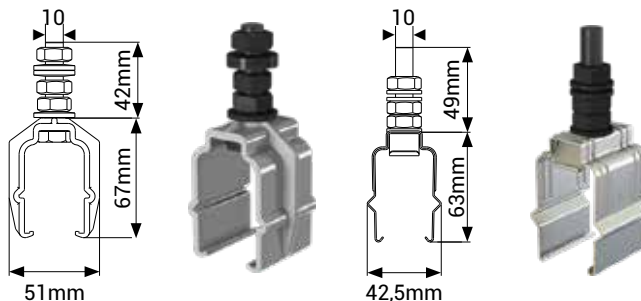
### URC-A / URC-AX Current Collector Brush (300A)

Description	Order Code
URC-A Current Collector Brush	1003516



### URC-A / URC-AX Sliding Hanger

Description	Order Code
URC-A Plastic Sliding Hanger	3033986
URC-A Steel Sliding Hanger	3132893

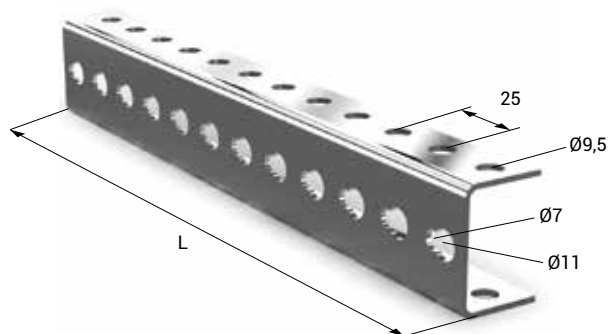
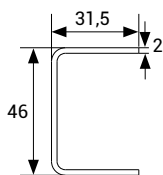


Plastic Sliding Hanger

Steel Sliding Hanger

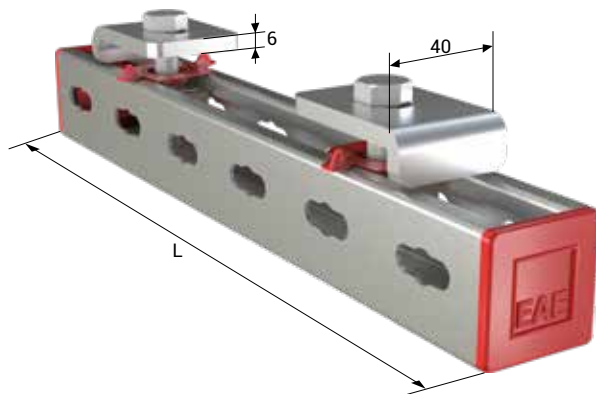
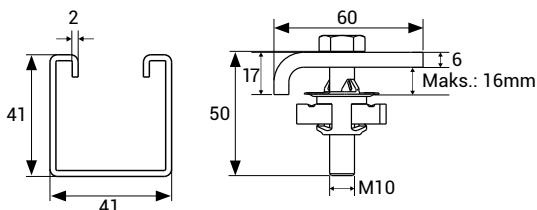
### URC-A / URC-AX Hanger Bracket

Description	Order Code
URC-A Hanger Bracket (750mm)	3025382



### URC-A / URC-AX Binrak Hanger Bracket

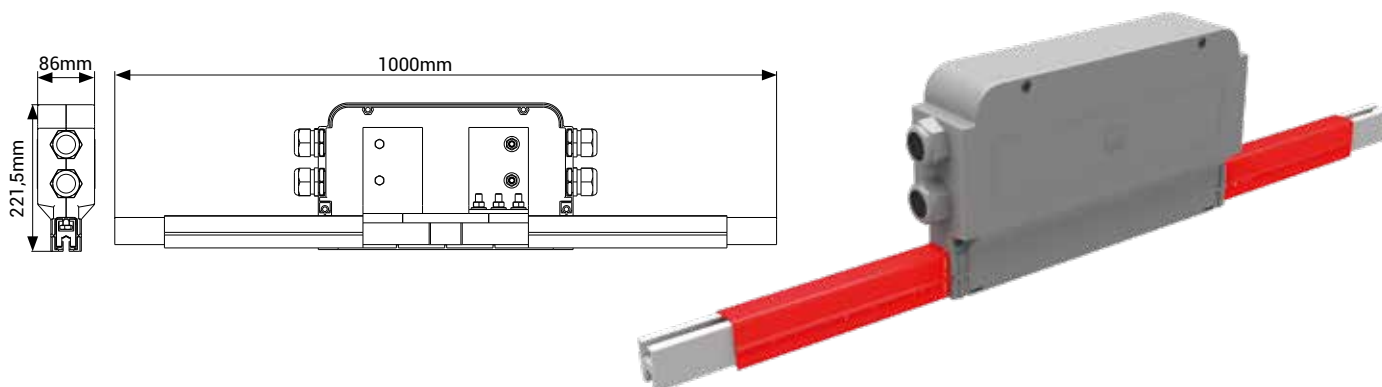
Description	Order Code
URC-A BR Hanger Bracket (800mm)	3178918





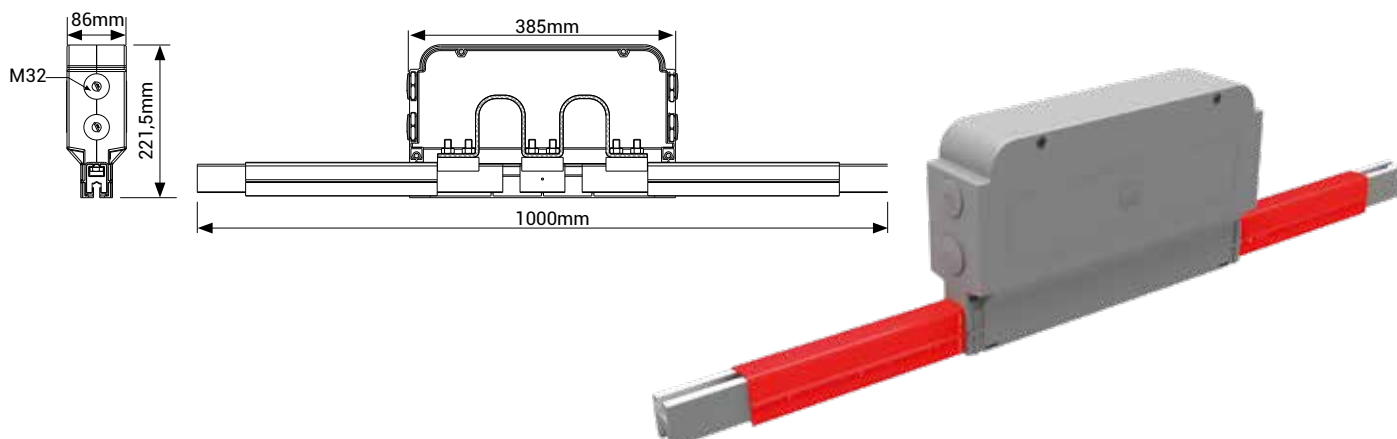
### URC-A / URC-AX Repair Zone Module

Aluminium Conductor	C-PVC Housing (-40°C +55°C)		PC (Polycarbonate)Housing (-40°C +100°C)	
	URC-A		URC-AX	
	Phase	Neutral	Phase	Neutral
URC Repair Zone Module	3055997	3055998	3164919	3164920

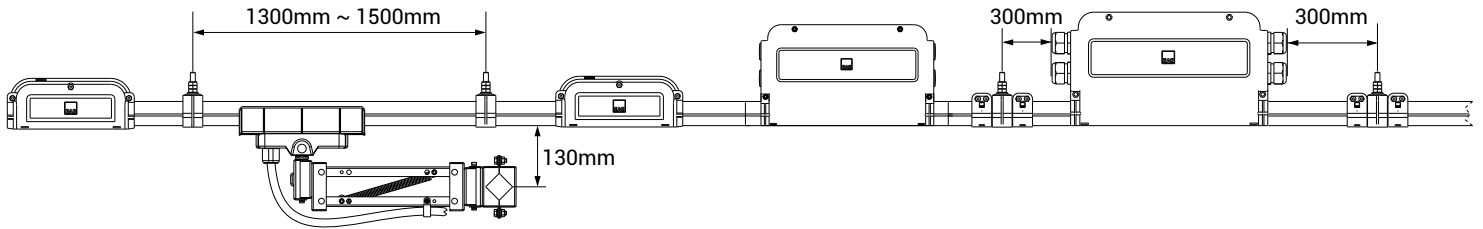


### URC-A / URC-AX Expansion Unit

Aluminium Conductor	C-PVC Housing (-40°C +55°C)		PC (Polycarbonate)Housing (-40°C +100°C)	
	URC-A		URC-AX	
	Phase	Neutral	Phase	Neutral
URC 050 Expansion Unit (500A)	3033983	3033984	3164925	3164926
URC 080 Expansion Unit (800A)	3033981	3033982	3164923	3164924
URC 100 Expansion Unit (1000A)	3033979	3033980	3164921	3164922

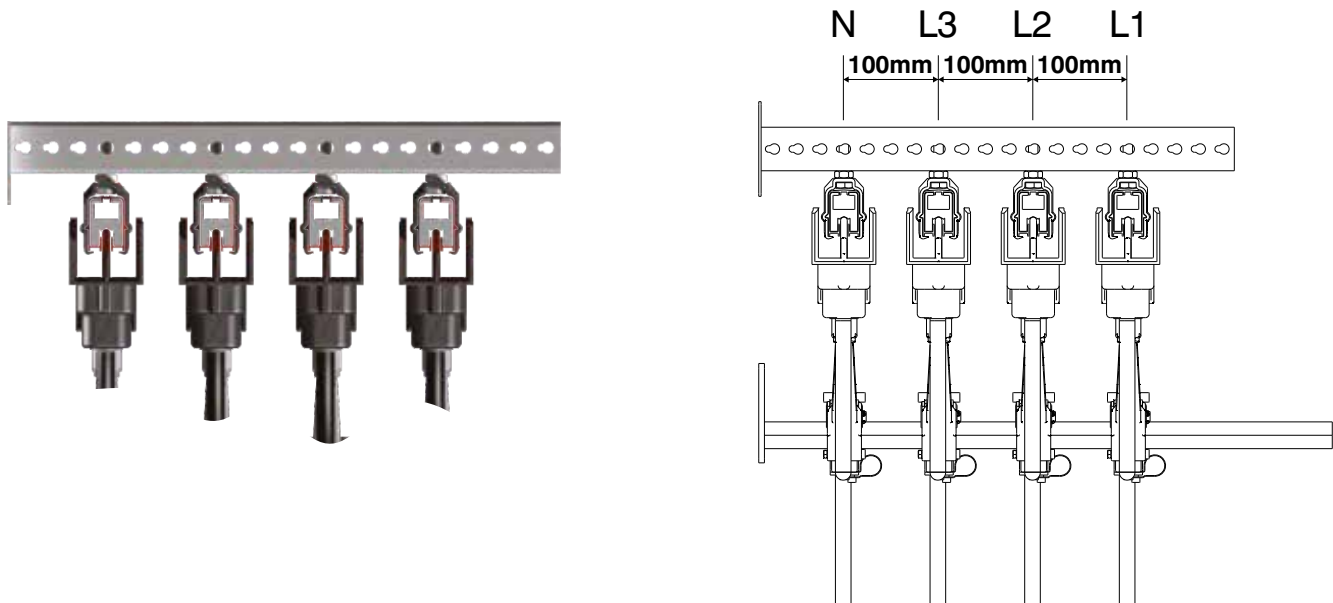


The expansion module should be used every 50 meters between the fixed points in order to protect the system from being damaged by the expansion that may occur due to heat



- Distance between the sliding hangers should be 1300 ~ 1500mm.
- Distance between Feeder Units and other units should be minimum 300mm.

### Installation



- For installation distance at least 100mm, should be between sliding hanger axes.

The voltage drop in the busbar lines shall be inspected as per the busbar type selected according to the total current calculated based on the ambient temperature and operating period of the system. Maximum acceptable value for voltage drop is 3%.

**For Direct Current**

$$\Delta U = 2.L_t I_G R$$

$\Delta U$  = Voltage Drop [V]

**For Mono-Phase Alternative Current**

$$\Delta U = 2.L_t I_G Z$$

$I_G$  = Total current [A]

$R$  = Resistance of the busbar [ $\Omega/m$ ]

**For Three-Phase Alternative Current**

$$\Delta U = \sqrt{3}.L_t I_G Z$$

$Z$  = Impedance of the busbar [ $\Omega/m$ ]

$L_t$  = Calculated Hole Length [m]

**Note :** Calculation of the current drawn during first start in various motor types;

$I$  = Total current drawn in the first start of the motors [A]

For the starting current; Three-phase asynchronous drive in direct start

$I_A$  =  $I_G$  x calculated as 5 to 6

Slip ring rotor motor

$I_A$  =  $I_G$  x calculated as 2 to 3

Frequency converter

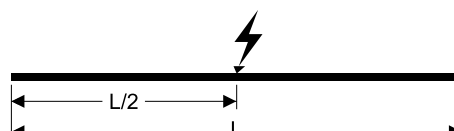
$I_A$  =  $I_G$  x 1,20 to 1,50 calculated between.

### ►► CALCULATION OF FEEDING POINTS

When we take L as the length of the line, feeding points may be selected as shown in the diagrams below to keep the L voltage drop at minimum and it may be used as the hole length for the calculation of L voltage drop.



1 feeding point from the start,  $L_t=L$



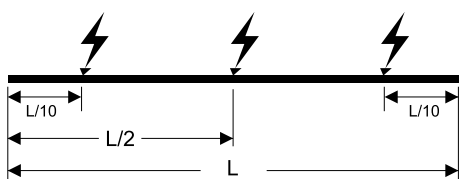
1 feeding point from the center,  $L_t=L/2$



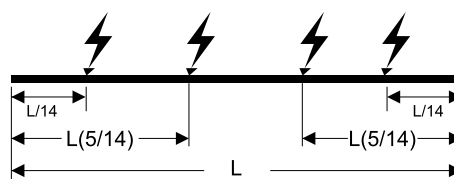
2 feeding points from the start points,  $L_t=L/4$



2 feeding points,  $L_t=L/6$

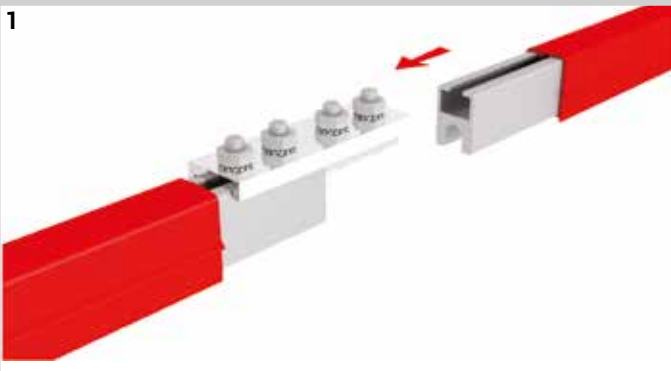


3 feeding points,  $L_t=L/10$

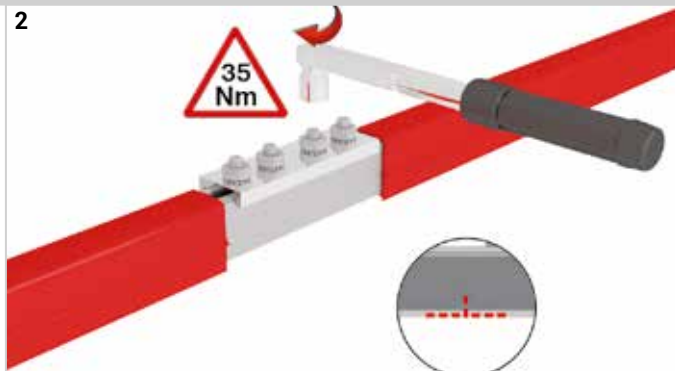


3 feeding points,  $L_t=L/14$

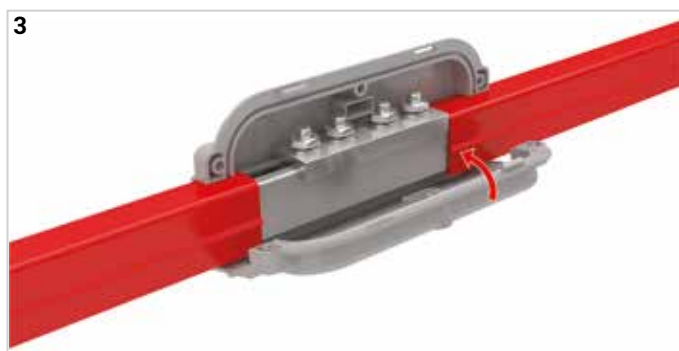
### URC-A Joint Unit Installation Manual



1 Place the joint unit between the two busbar lengths to be joined with their bolts facing upwards as shown. The notch of the joint unit should be at the centre of the junction of the two Busbars.



2 Tighten the nuts with torque wrench adjusted to 35Nm.

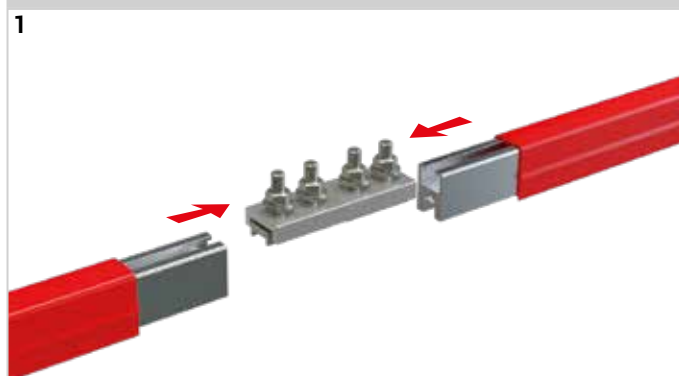


3 Place the joint unit covers facing each other. Put the bolts and nuts in the sockets.

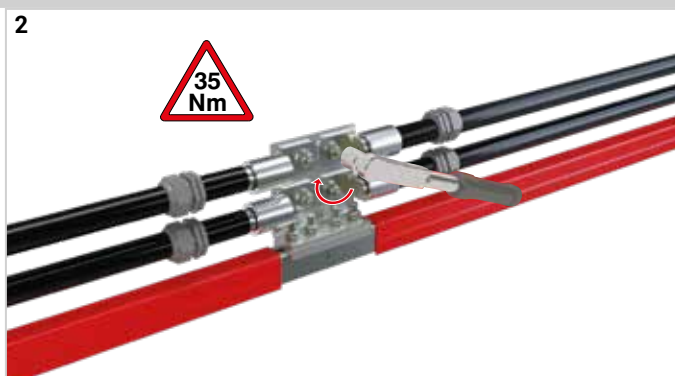


4 Tighten the the bolt with 5 allen wrench.

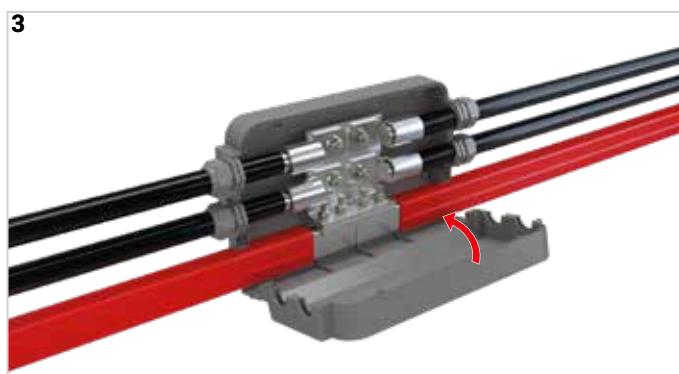
### URC-A Feeder Unit Installation Manual



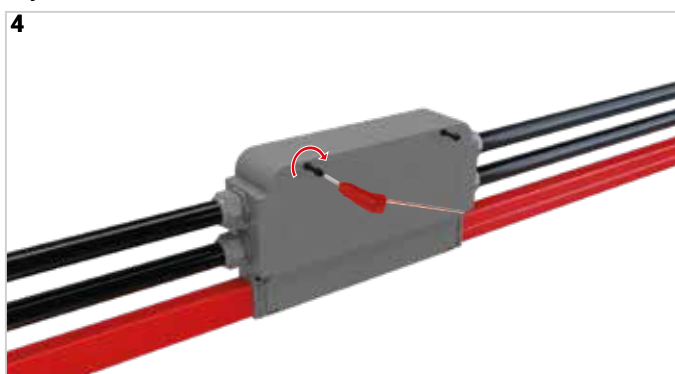
1 Place the joint unit between the two busbar lengths to be joined with their bolts facing upwards as shown.



2 Pass the cables feeding the system through cable gland, tighten the nuts of the connecting plate with a torque wrench adjusted to 35Nm.

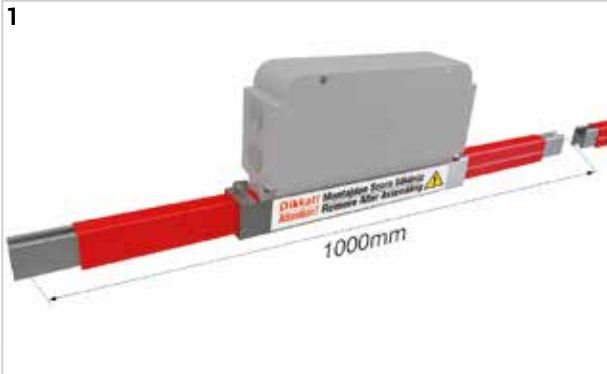


3 Place the feeder unit covers facing each other.

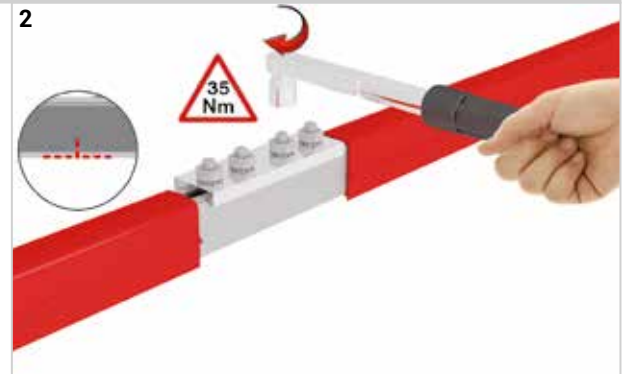


4 Put the bolts and nuts in the sockets.

### URC-A Expansion Unit Installation Manual



Please be sure that the expansion unit length is 1000mm. If the measured length is different from 1000mm, move the busbar forward or backward for adjustment. Place the joint unit between the two busbar lengths to be joined with their bolts facing upwards as shown.



Tighten the nuts with torque wrench adjusted to 35Nm.



Remove the bolts of the steel alignment jig on the expansion unit.



Throw the steel alignment jig into the recycling bin.

	Component List			
Item No	Component	Quantity	Company :	Prepared by
			Project :	
			Project No:	Date :
				Signature :

Please duplicate this page for your own use.

Date :

Project Name	:	<input type="text"/>
Company	:	<input type="text"/>
Name Surname	:	<input type="text"/>
Tel	:	<input type="text"/>
E-Mail	:	<input type="text"/>
Address	:	<input type="text"/>

### General Data

Track Length	:	<input type="text"/>
Number of Cranes on Track	:	<input type="text"/>
Crane Travel Speed	:	<input type="text"/>

### Environmental Data

Operating Environment	:	<input type="checkbox"/> Indoor	<input type="checkbox"/> Outdoor
Ambient Temperature	:	<input type="text"/> °C min.	<input type="text"/> °C max.
Other Operating Conditions (Humidity, Dust, Chemical Influence, etc.)	:	<input type="text"/>	

### Electrical Data

Operating Voltage	:	<input type="text"/> Volts	<input type="checkbox"/> AC	<input type="checkbox"/> DC			
		<input type="text"/> Phases	<input type="checkbox"/> N	<input type="checkbox"/> PE			
Position and Number of Feeder	:	<input type="text"/> from End	<input type="text"/> from Middle				
Duty Cycle (%)	:	<input type="checkbox"/> 50%	<input type="checkbox"/> 60%	<input type="checkbox"/> 70%	<input type="checkbox"/> 80%	<input type="checkbox"/> 90%	<input type="checkbox"/> 100%

Motor Specifications	Crane - 1		Crane - 2		Crane - 3	
	Power (kW)	Current (A)	Power (kW)	Current (A)	Power (kW)	Current (A)
Hoist motors	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Auxiliary motor	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Long travel	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Cross travel	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

### Options

Brackets Required	:	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Repair Zone Required	:	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Collector Replacement Required:		<input type="checkbox"/> Yes	<input type="checkbox"/> No
		<input type="text"/> Qty	<input type="text"/> Qty
Descriptions	:	<input type="text"/>	


Please duplicate this page for your own use.



Item No	Component List		
	Component		Quantity
[Large grid area for component listing]			

Company :  
Project :  
Project No:

Name :  
Date :  
Signature :  
Prepared by



# PRODUCT TYPES

## BUSBAR ENERGY DISTRIBUTION SYSTEMS



## CABLE TRAYS



## TROLLEY BUSBAR ENERGY DISTRIBUTION SYSTEMS



## INDOOR SOLUTIONS



## SUPPORT SYSTEMS



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Catalog 15-En. / Rev. 13 500 pcs. 13/12/2021  
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