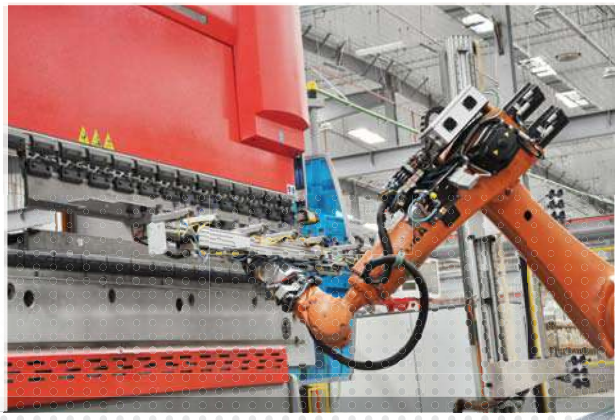
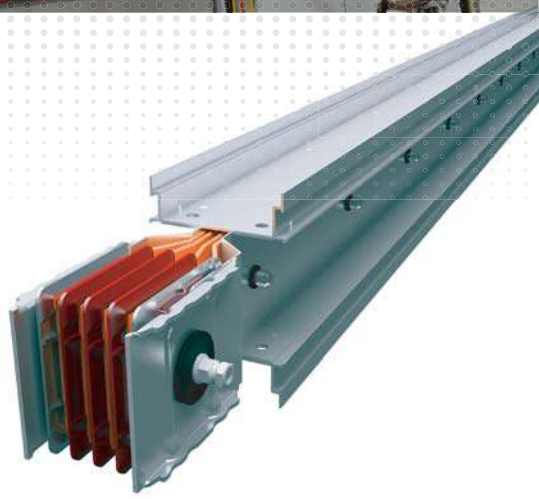
TRANSFORMERS & BUSWAYS SOLUTIONS



COMPACT BUSWAYS - HE



BAHRA TBS

BAHRA TBS CAST RESIN TRANSFORMERS & BUSWAYS SOLUTIONS

The power solutions for commercial and industrial sector applications

HIGH EFFICIENCY CAST RESIN TRANSFORMERS UP TO 5000 KVA

Bahra TBS high-quality cast resin transformer are the ideal choice for all needs thanks to their different advantages:

- Total safety for the customer, guaranteed by the total absence of combustible products,
- Maximum environmental protection, thanks to the absence of polluting and flammable insulating liquids.
- Energy saving, with the exclusive “reduced loss” range.
- Maximum flexibility straight from the beginning of the installation.

COMPACT BUSWAY FROM 800 TO 6300 A

The busway is the most modern solution for the distribution of energy in an installation for machinery, equipment and lighting fittings, in all types of buildings.

The busway is also frequently used to power the (horizontal and vertical) backbones of buildings used for the commercial-service sectors, thus observing the time required for the installation and providing a final solution with remarkable technical advantages.

INDEX: Busways

BAHRA TBS FACTORY OVERVIEW

INTEGRATED SOLUTIONS FOR GLOBAL PROJECTS

Bahra Electric began in 2008 and it is a leading manufacturer of an extensive range of electricity distribution products. In 2015, **Bahra Electric** expanded its manufacturing facilities & product range by creating a new factory **"Transformers and Busways Solutions Company"** specialized in producing high efficiency transformers and busways in partnership with **Legrand France** as an initiative to localize the important industries in the kingdom of Saudi Arabia and to become market leader in its industry.
In-line with Kingdom of Saudi vision 2030, **Bahra Electric** has acquired **Transformers and Busways Solutions Company (TBS)** in 2021 and has signed a license agreement with **Legrand France SA** permitting to use the existing designs and knowhow. **Bahra Electric** has crafted the new brand of TBS to be a **Bahra TBS.**

Bahra TBS is spread across 50,000 sq m area equipped with state-of-the-art latest European & Italian technology with complete backward process integration including epoxy casting and tinning. The manufacturing facility have implemented the Integrated Management Systems: ISO 9001, ISO 14001 & OHSAS 18001 as well as SASO mark.

Details matter. At TBS you can rest assured that your project is managed and executed in a pro fessional manner. Every single detail is important. A full-fledged team of experts overlook your projects from the very beginning of the design stage all the way to the testing and commissioning and even after the handing over of your project.

Design Support

We provide consultants a design support from the very beginning. Our design department is able to make solid electrical systems covering every detail of your requirements.

Technical Support

Our skilled technical expertise is at your disposal for consultation, training, orientation and support during the course of your project. We conduct regular training courses.

Product Availability

Our factory along with our wide network of partners and distributors in the Middle East region ensure a sustainable product availability to secure fast deliveries, efficient logistics alteration.

Testing & Commissioning

We cover all preliminary tests and inspections, functional performance tests and the supervision of commissioning of busways & transformers.

After Sales Service

A vast team of technical experts within Bahra TBS and our partners' teams are at your disposal for extending full After Sales Support meeting your expectations.

Technical Support at your service

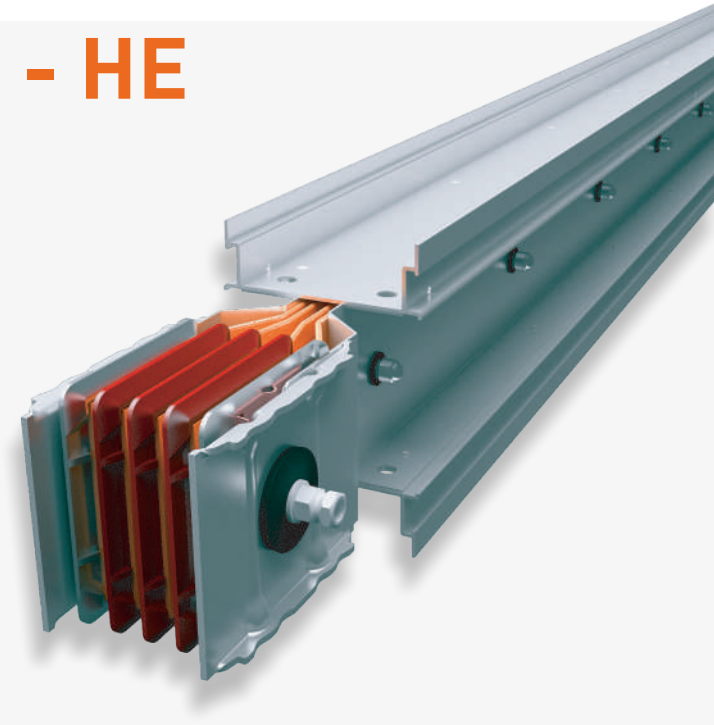
Bahra TBS with its innovation and cutting-edge technology continue setting up latest trends in the market which enables us to meet the needs of our customers. You can be assured that your project is handled in the most efficient and professional manner meeting the industry standards and specifications.

We have all the necessary resources used to keep pace with market trends through our:

- Technical expertise - capable of providing the most practical and cost effective solutions for projects of any size.
- Bahra TBS Design office - supports customers throughout every step of their project providing a single contact, which is competent and easy to reach.
- Strong presence and experience of all our partners and distributors in the market.

COMPACT BUSWAYS - HE

BAHRA TBS PRODUCT OFFER



BUSWAYS FROM 800 TO 6300 A

Complete market coverage from standard specs to high specs rating **(low current density)**

EPOXY INSULATION

- High operating temperature
- Dielectric strength
- Requires thin coating which is better for heat dissipation
- Fusion bonded epoxy prevents moisture penetration
- Seamlessly Insulates holes in busbars

COPPER CONDUCTOR

- High electrical conductivity
- Resistance to oxidation
- Thermal resistance
- Reliable Strength & durability

ALUMINUM CASING

- Light weight
- Corrosion resistance
- High thermal conductivity
- Easy to manufacture

APPLICATIONS

- High rise building
- Hotels
- Hospitals
- Banks
- Airports
- Data Center
- Industries
- Shopping Centers

Compact BUSWAYS (Main Features)

- availability in the standard range: **from 800 A to 6300 A** with **copper** conductors.
- compact dimensions enhance **its resistance to short circuit stresses.**
- low impedance of the circuit; by controlling the voltage drops and allow for the installation of high power electrical systems, even in extremely confined spaces.
- Excellent performances the installation and design of the paths is quick, easy, and flexible.
- availability with **a wide selection of tap-off boxes that range from 63 A up to 1250 A,** thus allowing you to locally protect and feed different types of loads by housing protective devices such as fuses, MCCBs and motorised switches
- compliance with the IEC 61439-6 standard;
- **referred to the average ambient temperature of 35 °C** against the required by the Standard.
- Insulation Material Epoxy
- Casing: Aluminum
- IP Protection 55[1]
- Grounding / Earthing
- Insulation Class B[2]
- **Certification:** Complete range is fully type tested by LOVAG, SASO & ISO.

[1] IP65/IP66 available upon request
[2] Class F insulation available upon request

COMPACT BUSWAYS - HE

BAHRA TBS PRODUCT OFFER

Straight elements:

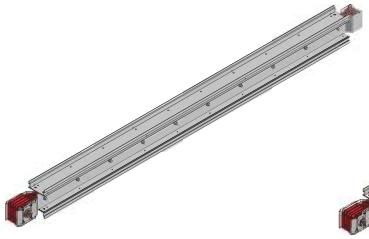
Supplied with its pre-installed monobloc.

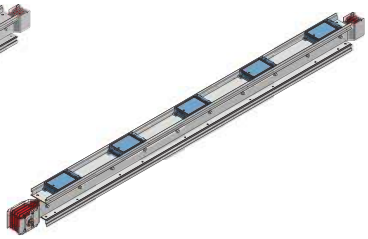
Feeder elements:

- Standard length: 3 m
- Special length: from 1 m to 3 m

Distribution elements with tap-off outlets:

- Standard length: 3 m
- Tap-off outlets: Up to 5+5 spaced at 580 mm.

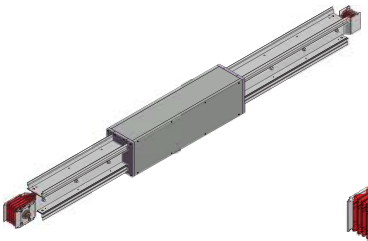


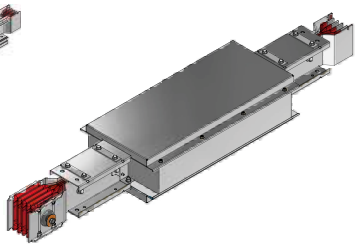


Additional elements:

Supplied with its pre-installed monobloc.
Elements able to meet any installation requirement.

Elements with S120 fire barrier
Elements with phase balancing
Elements with thermal expansion

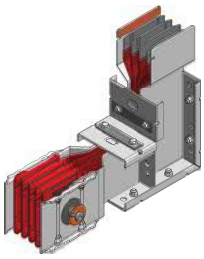


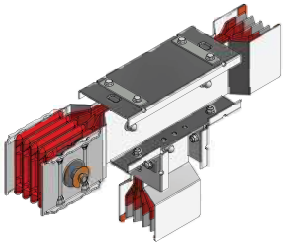


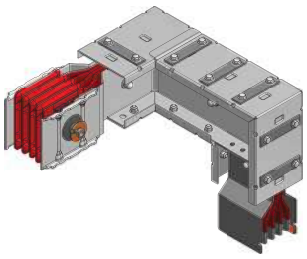
Angle components:

Supplied with its pre-installed monobloc.
Elements able to meet any change of direction with standard or special solutions.

Elbows
Double elbows
Special T, X elements







Tap-off boxes:

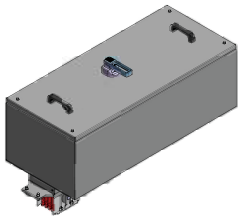
Elements used for connecting and energizing electric loads.

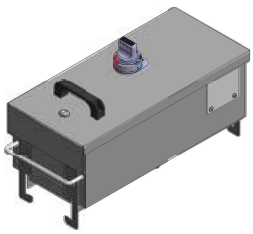
Plug-in tap-off boxes from 63 A up to 630 A:
(can be installed with busbar energized)

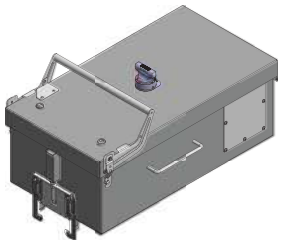
- with 3P fuse holders
- with switch disconnector and fuse holder
- Compatible with different brand of MCCB'S

Bolt-on tap-off boxes from 800 A to 1250 A:

- with switch disconnector and fuse holder
- for DPX³ circuit breakers

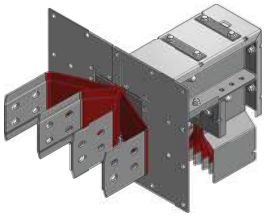


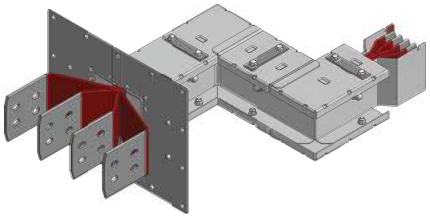




Connection interfaces:

Elements used for connecting the busbar to the electric board or transformer.

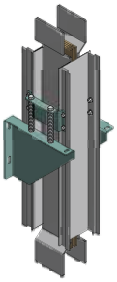


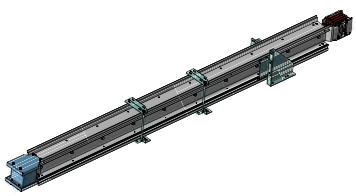


Fixing supports:

Elements used for fixing the busbar to the structure of the building.

Options for horizontal installations
Options for vertical installations
Options for special applications like Seismic areas.





BAHRA TBS BUSWAY

ADVANTAGES

Practicality

The electric design of the busbars is achieved in compliance with the product Standards. The rated current of our busbars is guaranteed at a room average temperature of 50 °C.

After choosing the busbar which is able to meet the operating current regulations, it will be very easy to verify the voltage drop as well as the protection against overcurrents by using the technical tables available for all our production lines.

In particular, these tables define a wide range of technical data which allow the planning engineer to carry out calculations with electric values, which are not estimated but the result of measurements made during heating and short circuit tests (in certified LOVAG laboratories), which have certified all product lines.

When using busbars, the load protection is located very close to the device (decentralized protection); Tap-off boxes can contain protection devices such as thermal magnetic circuit breakers, fuse carriers and motorized switches which allow you to easily and efficaciously manage the system.

Flexibility

By using the outlet windows located on the straight elements, the busbars provide high management flexibility, both when planning (electrical engineer) and when installing the system (installer); they are also used for the unavoidable changes required by the electric system to adapt to the varied needs of the end user during the life of plant.

The Tap-off boxes can be inserted and removed from their outlets when the busbar is electrically powered and inserted in another plug outlet, thus avoiding downtime.

No more point-point connections but only one power distribution system to which you will always be able to connect to wherever there is a free window.

Because of its flexibility and durability features Bahra TBS's busbar, installed inside a building, allows you to easily change the destination of its intended use of the rooms, thus giving also advantages to those who manage and locate the various parts of the building premises.

Quick installation

The busbar's junction and fixing systems have been designed and created to install busbars easily. In a cable and tray system, the time required to install only the tray is the same used to install a complete system in busbars.

Example of Bahra busbar system

Safety

A busbar does not use large amounts of insulating plastic material and potentially dangerous materials in case of fire.

Furthermore, the plastic materials used for the insulating parts of the busbars are always self-extinguishing (from V0 to V2) and the gas emission is generally very low (Halogen Free). Low electromagnetic emission is another advantage of the busbars as a result, the metal plate casing of the busbars serves as a screen for the electric field (shielded enclosure); the extreme vicinity between the phase conductors also reduces considerably the emission of the magnetic field.

The tests carried out on one of our 2500 A busbars at full operating current has shown that the emission of the magnetic field (magnetic induction) is lower than the "target level" of the Decree at a distance of 0.3m, whereas the threshold considered as the "quality target" can be achieved at a distance of only 0.7m from the busbar.

These features make our busbars the unavoidable choice for hospital facilities, data processing centres and wherever it is necessary to supply a large amount of power in the proximity of workplaces and/or sensitive equipments.

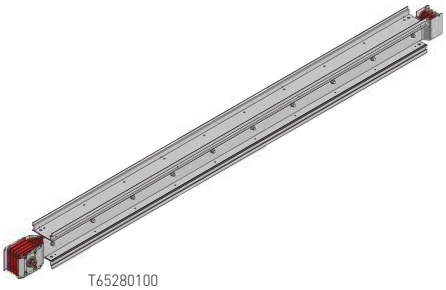
Reduced dimensions

The overall dimensions of the busbars are generally smaller than an equivalent system made with cables, especially when the currents to be carried exceed 1000A and when several cables in parallel are necessary to ensure such capacity.

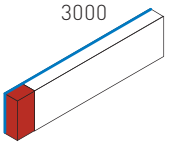
Other advantages can be achieved when there are changes of direction where the radius of curvature of the cables is minimal and enough to not damage the insulating material; busbars allow you to change directions with 90° angles, thus optimizing the small spaces used in service areas.

Compact BUSWAYS - HE

straight elements



T65280100

Cat.Nos	In (A)	L (mm)
Cu		
		Straight elements for transport
T65280100 T65280101 T65280103 T65280105 T65280106 T65280108 T65390105 T65390106 T65390108	800 1000 1250 1600 2000 2500 3200 4000 5000	3000 
T65280110 T65280111 T65280113 T65280115 T65280116 T65280118 T65390115 T65390116 T65390118	800 1000 1250 1600 2000 2500 3200 4000 5000	700-1000
T65280170 T65280171 T65280173 T65280175 T65280176 T65280178 T65390175 T65390176 T65390178	800 1000 1250 1600 2000 2500 3200 4000 5000	1001-1500
T65280120 T65280121 T65280123 T65280125 T65280126 T65280128 T65390125 T65390126 T65390128	800 1000 1250 1600 2000 2500 3200 4000 5000	1501-2000
T65280180 T65280181 T65280183 T65280185 T65280186 T65280188 T65390185 T65390186 T65390188	800 1000 1250 1600 2000 2500 3200 4000 5000	2001-2500
T65280150 T65280151 T65280153 T65280155 T65280156 T65280158 T65390155 T65390156 T65390158	800 1000 1250 1600 2000 2500 3200 4000 5000	2501-2999

* Item code will change for the special dimensions.

Compact BUSWAYS - HE

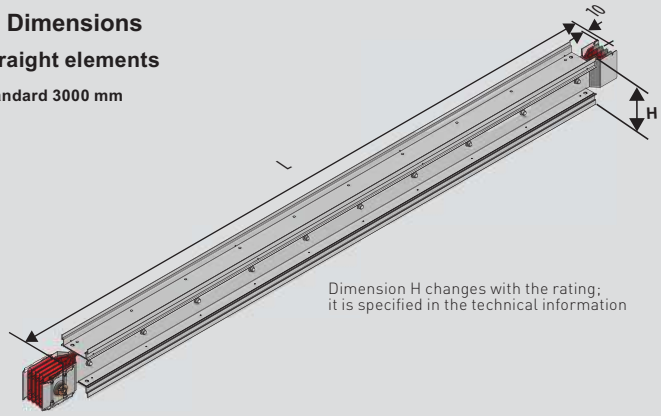
straight elements

Compact BUSWAYS – HE:
Reference standard: IEC 61439-6. Reference temperature: 50°C
Protection degree: IP55*. Thickness of top cover: 2.5 mm and side casing 2 mm. No. of conductors: 4C, 4.5C or 5C. Painted: RAL 7035.
Halogen Free. The insulation between bars is ensured by Epoxy class B (130°C)*. All plastic (Insulator) components have a V1 self-extinguishing degree (as per UL94); they are fire retardant and comply with the glow-wire test according to standards.
*IP65 / IP66 / Class F (155°C) Epoxy Insulation - available on request.

Dimensions

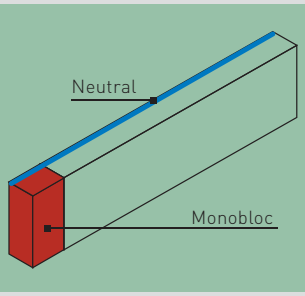
Straight elements

Standard 3000 mm



MIN AND MAX DIMENSIONS OF SINGLE AND DOUBLE BAR	
Copper (Cu)	800A – 6300A
(L) min/MAX [mm]	700/3000

NOTES
The product versions in the whole catalogue will be simplified as shown highlighting the part with the monobloc installed in red and the neutral side in blue. In the whole catalogue, the measurements shown refer to the element centre distance



The range is also available on request in different versions:
(5 Conductors with dedicated PE conductor, double neutral and more others...)

Current Density

BAR	STANDARD	
	Ratings (A)	**Density (A/mm2)**
SINGLE	800	2.60
	1000	3.05
	1250	3.03
	1600	3.13
	2000	2.83
	2500	2.77
DOUBLE	3200	2.50
	4000	2.49
	5000	2.42

Standard Rating

Single bar:
800A-2500A (Cu)
Double bar:
3200A-5000A (Cu)

Compact BUSWAYS - HE

straight elements (continued)

T65280130

Cat.Nos

Straight elements for distribution

Cu	In (A)	N° outlets	L (mm)
T65280130	800	3+3 **	3000
T65280131	1000		
T65280133	1250		
T65280135	1600		
T65280136	2000		
T65280138	2500		
T65390135	3200		
T65390136	4000		
T65390138	5000		
T65280970	800	1+1	1000-1500
T65280971	1000		
T65280973	1250		
T65280975	1600		
T65280976	2000		
T65280978	2500		
T65390975	3200		
T65390976	4000		
T65390978	5000		
T65280920	800	2+2 **	1501-2000
T65280921	1000		
T65280923	1250		
T65280925	1600		
T65280926	2000		
T65280928	2500		
T65390925	3200		
T65390926	4000		
T65390928	5000		
T65280980	800	2+2 **	2001-2500
T65280981	1000		
T65280983	1250		
T65280985	1600		
T65280986	2000		
T65280988	2500		
T65390985	3200		
T65390986	4000		
T65390988	5000		
T65280950	800	3+3 **	2501-2999
T65280951	1000		
T65280953	1250		
T65280955	1600		
T65280956	2000		
T65280958	2500		
T65390955	3200		
T65390956	4000		
T65390958	5000		

Compact BUSWAYS - HE

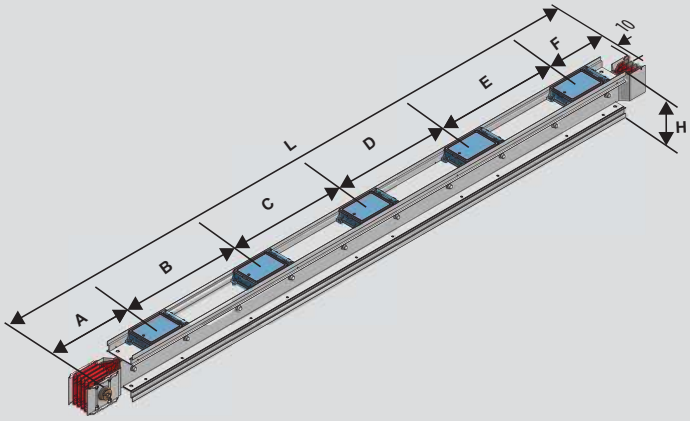
straight elements (continued)

Dimensions

Straight elements for distribution

- Straight elements for plug-in type tap-off boxes
- Standard 3000 mm
- Tap-off outlets on both sides

Straight elements enable the application of plug-in boxes on appropriate outlets
Available in lengths from 1 to 3 meters, these elements have respectively 3+3(with 870 pitch and 5+5 (with 580 pitch).

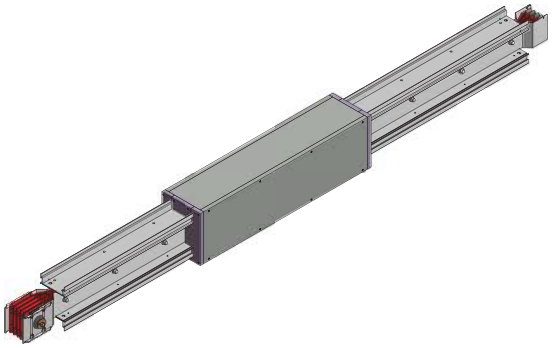


Dimension H changes with the ratings and it is specified in the Technical information

MIN AND MAX DIMENSIONS OF SINGLE AND DOUBLE BAR	
Copper (Cu)	800A – 6300A
(L) min/MAX [mm]	1250 ***/3000

(***)For the length from 1000 mm to 1250 mm is possible to install only plug-in boxes Type 1 and 3
From 1250 mm to 3000 mm is possible to install all types of plug-in boxes
Compatible boxes are listed in dedicated chapter

(**) at request is possible to have others combinations of outlets:
lenght: 1000÷3000 - outlets: (1+1)
lenght: 1501÷3000 - outlets: (1+1) and (2+2)
lenght: 2501÷3000 - outlets: (1+1),(2+2) and (3+3)
lenght: 3000 - outlets: (1+1),(2+2),(3+3) and (5+5)
Possibility to have outlets in special position



T652EFB51

Cat.Nos

Fire barrier elements S120 (EN 1366-3, DIN 4102-09)

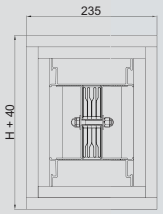
When the busbar trunking system crosses fire resistant walls or ceilings, it must be fitted with appropriate fire barriers
The fire barrier is 1000 mm (Cu) long and must always be positioned in the middle of the fire resistant wall or ceiling crossed by the busbar. After crossing fire resistant walls or ceilings, any cavity must be sealed with material meeting current regulations for the required building fire resistance class

Cu		In (A)	Type
T652EFB51	B120 4C	800-1250	external
T652EFB52	B160 4C	1600	
T652EFB53	B190 4C	2000	
T653EFB51	2B120 4C	2500	
T653EFB52	2B160 4C	3200	
T653EFB53	2B190 4C	4000	
		5000	

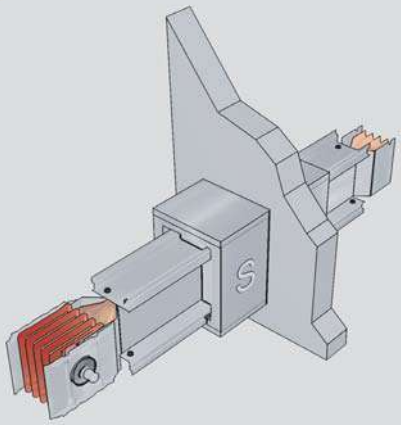
Compact BUSWAYS - HE
straight elements

Dimensions

Fire barrier elements



Fire barrier sizes
Dimension H changes with the rating; it is specified in the technical information



In order to ensure the maximum resistance class, for some ratings it is also necessary to fit at the factory an internal fire barrier following the indications on the table
It is therefore necessary to indicate at the order stage what elements will cross fire resistant walls or ceilings

Figure 1

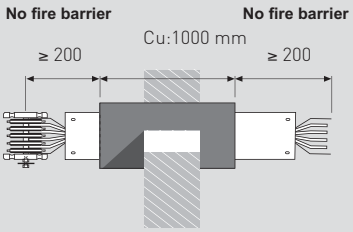
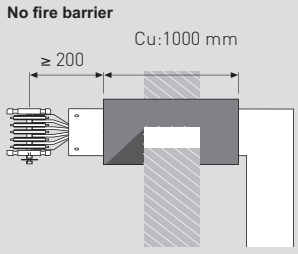


Figure 2

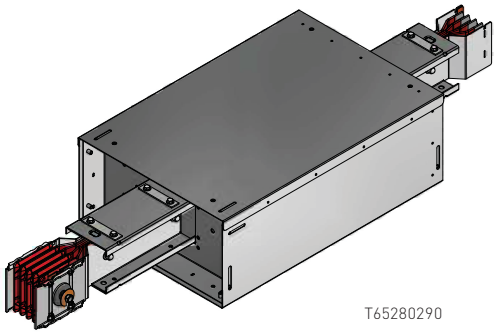


The external fire barrier can be used on any trunking component in compliance with the operating instructions specified in figures 1 and 2

Fire rated Busway available upon customer request.

Compact BUSWAYS - HE

straight elements (continued)



T65280290

Cat.Nos

Expansion element

Due to being subjected to temperature changes, both the busbar and the building suffer thermal expansions
The expansion element can absorb expansion and contraction of both the busbar trunking system section and the building, up to the maximum permitted length (50 mm approx.)
The expansion element must be fitted near the expansion joints of the building and in straight sections of the line (horizontal and/or vertical) longer than 40 m
For straight line sections longer than 40 m, expansion elements must be fitted in a way that splits the path into equal sections not longer than 40 m
busbar trunking system elements are designed to compensate for thermal expansion if the straight sections of the installation are less than
40 m; in this case no expansion element is necessary

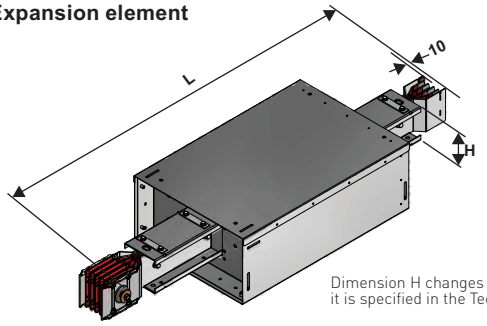
Cu	In (A)	Type
T65280200	800	L = 1.5 m Ideal for rising mains installation
T65280201	1000	
T65280203	1250	
T65280205	1600	
T65280206	2000	
T65280208	2500	
T65390205	3200	
T65390206	4000	
T65390208	5000	
T65280290	800	L = 3 m Ideal for horizontal installations
T65280291	1000	
T65280293	1250	
T65280295	1600	
T65280296	2000	
T65280298	2500	
T65390299	3200	
T65390296	4000	
T65390298	5000	

Compact BUSWAYS - HE

straight elements (continued)

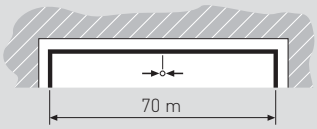
Dimensions

Expansion element

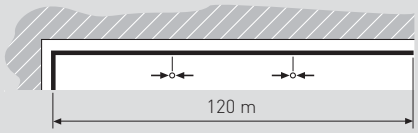


Dimension H changes with the ratings and it is specified in the Technical information

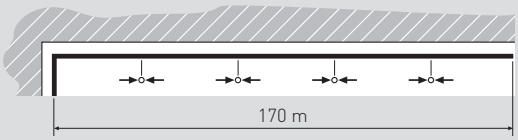
MIN AND MAX DIMENSIONS OF SINGLE AND DOUBLE BAR	
Copper	800A – 6300A
(L) min/MAX [mm]	1500 and 3000



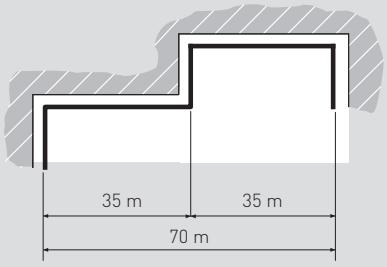
Example:
Straight section lenght 70 m = n°1 expansion element in the center of the line



Example:
Straight section lenght 120 m = n°2 expansion elements, one every 40 m



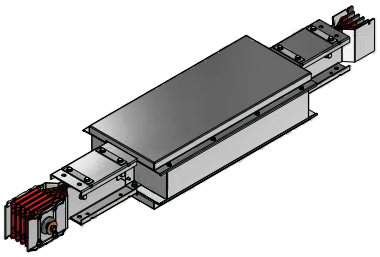
Example:
Straight section length 170 m = no. 4 expansion elements, one every 34 m



Example:
Section length 70 m. When the section is not straight, no expansion element is necessary

Compact BUSWAYS - HE

straight elements (continued)



T65287100

Cat.Nos		Phase balancing
Cu	In (A)	
T65287100	800	Straight elements with phase balancing are used to reduce and balance mutual phase reactance and impedance in case of long lines. In particularly long sections (→ 100 metres) it is recommended that two transposition elements are fitted (one at one third and one at two thirds of the path), to balance the system electric impedance: In this way, it will be possible to have along the installation path all the possible combination, of reciprocal positions among phases, minimising load losses
T65287101	1000	
T65287103	1250	
T65287105	1600	
T65287106	2000	
T65287108	2500	
T65397105	3200	
T65397106	4000	
T65397108	5000	

		Phase inversion
Cu	In (A)	
T65287120	800	The function of this element is to completely reverse the positions of the phases and the neutral. It is normally used in connections between transformer and electric board, or in the connections between electric boards, when the starting sequence is different from the arrival sequence
T65287121	1000	
T65287123	1250	
T65287125	1600	
T65287126	2000	
T65287128	2500	
T65397125	3200	
T65397126	4000	
T65397128	5000	

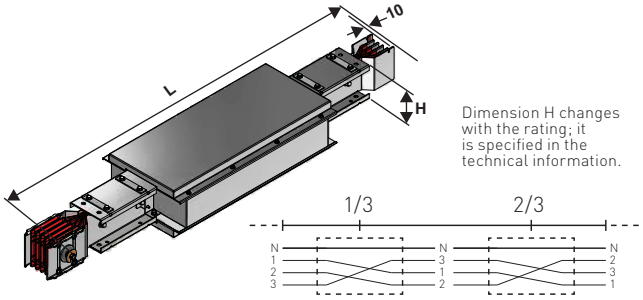
		Element with Neutral rotation
Cu	In (A)	
T65287140	800	The straight element with Neutral rotation is used to adapt the sequence of the busbar phases to the sequence of the connections required at the ends of the connections, should these be different. In the connection between electric boards, the neutral jump is normally used, as only the neutral position is normally identified
T65287141	1000	
T65287143	1250	
T65287145	1600	
T65287146	2000	
T65287148	2500	
T65397145	3200	
T65397146	4000	
T65397148	5000	

Compact BUSWAYS - HE

straight elements (continued)

Dimensions

Phase balancing 1500 mm

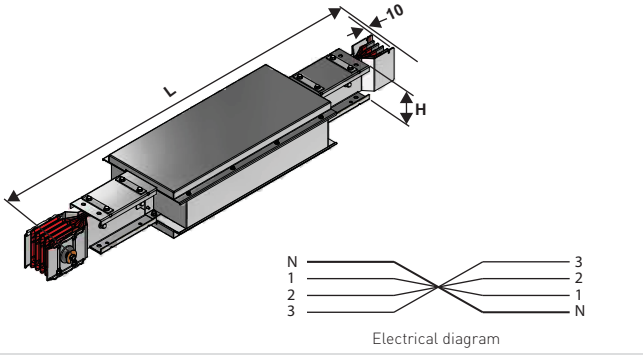


Electric diagram: Two elements offer all the possible reciprocal positions among the phases along the line

In particularly long carrying sections (→ 100 meters) it is recommended to insert 2 elements always by 2: (one placed at 1/3 and one placed at 2/3 of the trunking path) to balance the electric impedance of the system

For example, in a line exceeding 300 m it is recommended that one phase transposition is fitted at 100 m, and another one at 200 m

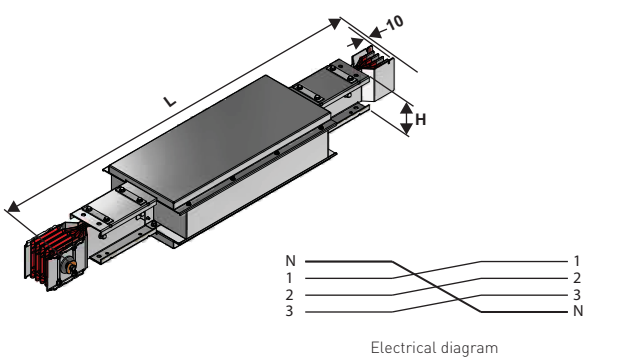
Phase Inversion 1500 mm



Electrical diagram

Warning: Use ONLY these elements for transport, and not for derivations (not use it when the line includes straight elements with derivations, or when they are provided for tap-off boxes even if bolted on the junction)
The position of all the conductors, including the neutral, changes, and may cause serious problems on a connected load, if one is not fully aware that the phase sequence and the position of the neutral DO NOT comply with those indicated in the pre-printed labels

Element with neutral rotation 1500 mm

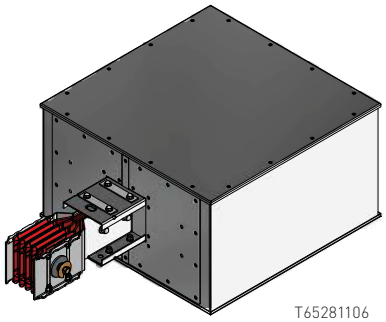


Electrical diagram

When the sequence of the distribution board phases is different from that of the transformer, it is possible to use an element that allows a neutral rotation

Compact BUSWAYS - HE

feed unit



T65281106

The feed units are used at the end of the lines, when the busbar must be powered using cables. They are available in the right (without Monobloc) and left (with Monobloc fitted) version
On request they are available with non-standard execution
End feed units for single bar busbars are supplied with an Aluminum blind back closing plate
For double bar busbar trunking systems the plates are 2
Both versions are fitted with 2 extra side steel flanges and 2 inspection steel flanges (dark grey colour)
The cable is connected directly to the busbars using bolts. For more information on board/busbar connection see the tables below (Dimensions For The Box)
To feed the power supply cable through the back power supply flanges it will be necessary to drill a hole in case of single bar and two holes in case of double bar.

Cat.Nos **Feed unit**

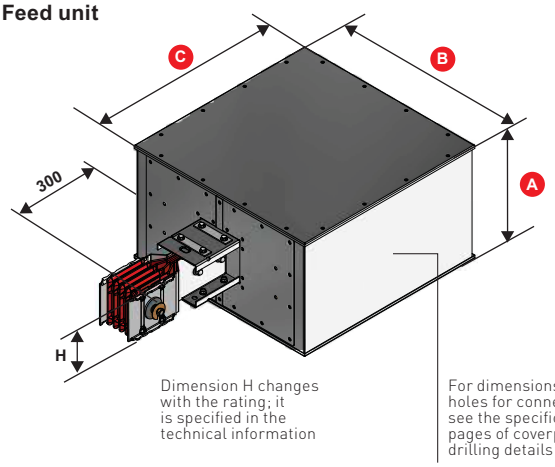
Cu	In (A)	Type
		Right type 2
T65281100	800	
T65281101	1000	
T65281103	1250	
T65281105	1600	
T65281106	2000	
T65281108	2500	
T65391105	3200	
T65391106	4000	
T65391108	5000	
		Left type 1
T65281110	800	
T65281111	1000	
T65281113	1250	
T65281115	1600	
T65281116	2000	
T65281118	2500	
T65391115	3200	
T65391116	4000	
T65391118	5000	

Compact BUSWAYS - HE

feed unit

Dimensions

Feed unit

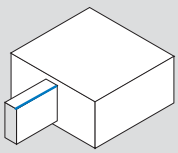
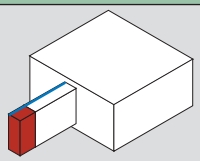


Rear cable input

Aluminum gland plate for cable entry 170 x 410 mm for Single Bar.
Aluminum gland plate for cable entry 400 x 400 mm(3x) for Double Bar.

Dimensions FOR THE BOX			
Cu	800A÷1250A	1600A÷2500A	3200÷5000A
(A) [mm]	350	350	630
(B) [mm]	610	610	610
(C) [mm]	610	810	810

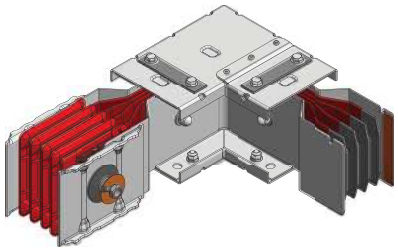
Special dimensions (not standard) are available on request, please contact Bahra TBS

Type 2 (without monobloc)	Type 1 (with monobloc)
	

CONNECTIONS				
Load (A)	The Copper (Cu) phase section is rounded up (mm^2)	No. of connection holes for each busbar conductor	No. of one-pole cables that can be connected to each phase	
800	600	4	4x150	2x300
1000				
1250	700	4	4x240	3x300
1600	850	8	4x240	3x300
2000	1100	8	5x240	4x300
2500	1400	8	6x240	5x300
3200	1700	16	8x240	6x300
4000	2100	16	9x240	7x300
5000	3000	16	14x240	10x300

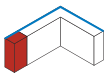
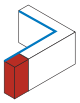
Compact BUSWAYS - HE

elbows



T65280300

Cat.Nos **Horizontal elbow**

Cu	In (A)	Type	Type
T65280300	800		
T65280301	1000		
T65280303	1250		
T65280305	1600		Standard
T65280306	2000		
T65280308	2500		
T65390305	3200		
T65390306	4000		
T65390308	5000		
T65280320	800	Right Type 1	
T65280321	1000		
T65280323	1250		
T65280325	1600		Special
T65280326	2000		
T65280328	2500		
T65390325	3200		
T65390326	4000		
T65390328	5000		
T65280310	800		
T65280311	1000		
T65280313	1250		
T65280315	1600		Standard
T65280316	2000		
T65280318	2500		
T65390315	3200		
T65390316	4000		
T65390318	5000		
T65280330	800	Left Type 2	
T65280331	1000		
T65280333	1250		
T65280335	1600		Special
T65280336	2000		
T65280338	2500		
T65390335	3200		
T65390336	4000		
T65390338	5000		

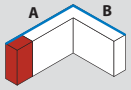
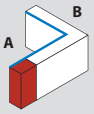
Compact BUSWAYS - HE

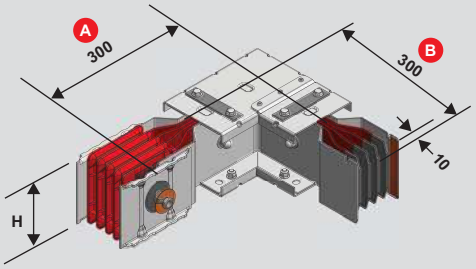
elbows

Dimensions

Horizontal elbow

In order to define the type of horizontal elbow required, consider to place the element "edgewise" (conductors perpendicular to the ground). In this configuration "horizontal" elbows enable a path variation parallel to the ground
When the neutral busbar conductor faces the outside of the elbow, there will be a Right horizontal elbow (type 1)
Contrariwise, with the neutral busbar conductor facing the inside of the elbow there will be a Left horizontal elbow (type 2)

Type 1	Type 2
	



The dimensions are referred to the standard elements.
Single/double bar (A+B): 300+300 mm

MIN AND MAX DIMENSIONS OF SINGLE AND DOUBLE BAR	
Single bar min/MAX	
A	300/1400*
B	300/1400*
Double bar min/MAX	
A	300/1400*
B	300/1400*

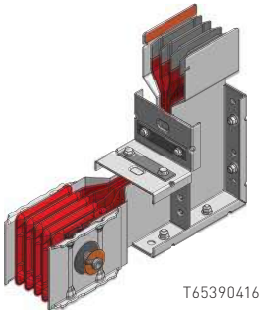
Dimension H changes with the rating; it is specified in the technical information

No standard elements "Special" (with measurements that are different from those show in the figure) are referred to the Min and Max dimensions specified in the table

* For all the non standard horizontal elbows (special), it is possible to have only one of the two sides in size exceeding 600 mm.
For example, when ordering an horizontal elbow with size A=650 mm, the B size will have to be ≤ 600 mm

Compact BUSWAYS - HE

elbows (continued)



T65390416

Cat.Nos **Vertical elbow**

Cu	In (A)	Type	Type
T65280400	800	Right Type 2	Standard
T65280401	1000		
T65280403	1250		
T65280405	1600		
T65280406	2000		
T65280408	2500		
T65390405	3200		
T65390406	4000		
T65390408	5000		
T65280420	800		Special
T65280421	1000		
T65280423	1250		
T65280425	1600		
T65280426	2000		
T65280428	2500		
T65390425	3200		
T65390426	4000		
T65390428	5000		
T65280410	800	Left Type 1	Standard
T65280411	1000		
T65280413	1250		
T65280415	1600		
T65280416	2000		
T65280418	2500		
T65390415	3200		
T65390416	4000		
T65390418	5000		
T65280430	800		Special
T65280431	1000		
T65280433	1250		
T65280435	1600		
T65280436	2000		
T65280438	2500		
T65390435	3200		
T65390436	4000		
T65390438	5000		

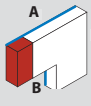
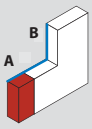
Compact BUSWAYS - HE

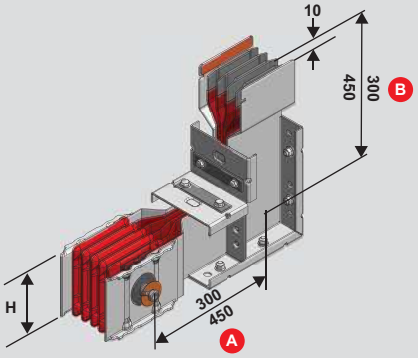
elbows (continued)

Dimensions

Vertical elbow

In order to define the type of vertical elbow, it is necessary to still place the element "edgewise" (conductors perpendicular to the ground), with the section with Monobloc facing the observer and the section without facing up. In this configuration, vertical "elbows" enable an up or down facing variation
If the neutral is on the left side, there will be a left vertical elbow (Type 1). If, on the other side, it is on the right side, there will be a right vertical elbow (Type 2)

Type 2	Type 1
	



The dimensions are referred to the standard elements
single bar (A+B) : 300+300 mm
double bar (A+B) : 450+450 mm

MIN AND MAX DIMENSIONS OF SINGLE AND DOUBLE BAR	
Single bar min/MAX	
A	300/1400*
B	300/1400*
Double bar min/MAX	
A	450/1400*
B	450/1400*

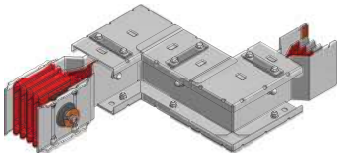
Dimension H changes with the rating; it is specified in the technical information

No standard elements "Special" (with measurements that are different from those show in the figure) are referred to the Min and Max dimensions specified in the table

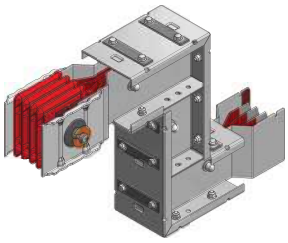
* For all the non standard vertical elbows (special), it is possible to have only one of the two sides in size exceeding 500 mm
For example, when ordering a vertical elbow with size A=650 mm, the B size will have to be ≤ 500 mm

Compact BUSWAYS - HE

elbows (continued)

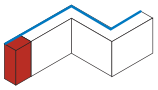
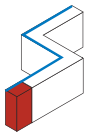


T65390346

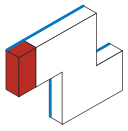
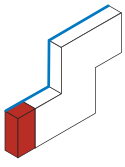


T65280456

Cat.Nos **Double horizontal elbow**

Cu	In (A)	Type
T65280340	800	 Right Type 1
T65280341	1000	
T65280343	1250	
T65280345	1600	
T65280346	2000	
T65280348	2500	
T65390345	3200	
T65390346	4000	
T65390348	5000	
T65280350	800	 Left Type 2
T65280351	1000	
T65280353	1250	
T65280355	1600	
T65280356	2000	
T65280358	2500	
T65390355	3200	
T65390356	4000	
T65390358	5000	

Cat.Nos **Double vertical elbow**

Cu	In (A)	Type
T65280440	800	 Right Type 2
T65280441	1000	
T65280443	1250	
T65280445	1600	
T65280446	2000	
T65280448	2500	
T65390445	3200	
T65390446	4000	
T65390448	5000	
T65280450	800	 Left Type 1
T65280451	1000	
T65280443	1250	
T65280445	1600	
T65280446	2000	
T65280448	2500	
T65390445	3200	
T65390446	4000	
T65390448	5000	

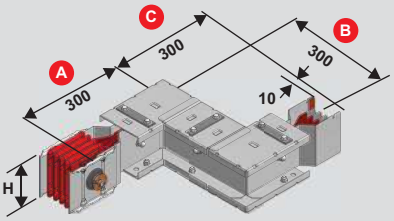
Compact BUSWAYS - HE

elbows (continued)

Dimensions

Double horizontal elbow

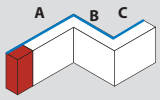
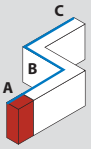
Double horizontal elbows are the union of two horizontal elbows; in order to define the type, it is enough to observe them starting from the Monobloc; if the first elbow met is left, we will have a double horizontal elbow left + right (Type 2). Contrariwise, if the first elbow met is right, we will have a double horizontal elbow right + left (Type 1)



MIN AND MAX DIMENSIONS OF SINGLE AND DOUBLE BAR	
Single bar min/MAX	
A	300/1000*
B	300/1000*
C	300/1000*
Double bar min/MAX	
A	300/1000*
B	300/1000*
C	300/1000*

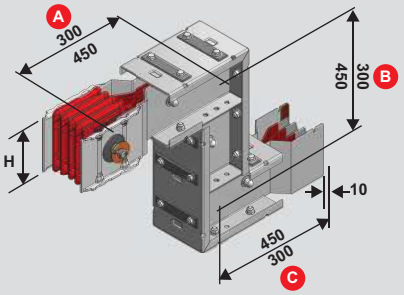
Dimension H changes with the rating; it is specified in the technical information

The dimensions are referred to the standard elements.
Single/double bar (A+B+C):
300+300+300 mm

Type 1	Type 2
	

Double vertical elbow

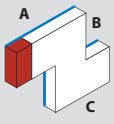
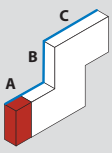
Double vertical elbows are the union of two vertical elbows; in order to define the type, it is enough to observe them starting from the Monobloc; if the first elbow met is left, we will have a double vertical elbow left + right (Type 1). Contrariwise, if the first elbow met is right, we will have a double vertical elbow right + left (Type 2)



MIN AND MAX DIMENSIONS OF SINGLE AND DOUBLE BAR	
Single bar min/MAX	
A	300/1000*
B	300/1000*
C	300/1000*
Double bar min/MAX	
A	450/900*
B	450/900*
C	450/900*

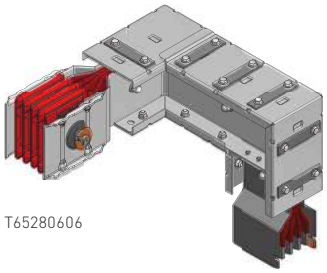
Dimension H changes with the rating; it is specified in the technical information

The dimensions are referred to the standard elements.
Single bar (A+B+C): 300+300+300 mm
Double bar (A+B+C): 450+450+450 mm

Type 2	Type 1
	

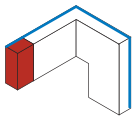
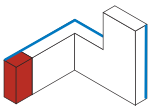
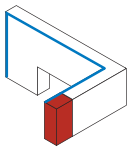
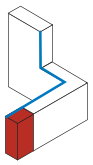
No standard elements "Special" (with measurements that are different from those show in the figure) are referred to the Min and Max dimensions specified in the table

* For all the non standard double Horizontal or double Vertical elbows (special), it is possible to have only one of the three sides in size exceeding 500 mm
For example, when ordering a double horizontal or double vertical elbow with size A=650 mm, the B and C size will have to be ≤ 500 mm



T65280606

Double elbow horizontal + vertical

Cat.Nos Cu	In (A)	Type
T65280600	800	
T65280601	1000	
T65280603	1250	
T65280605	1600	
T65280606	2000	
T65280608	2500	
T65390605	3200	
T65390606	4000	
T65390608	5000	
		 Type 1
T65280610	800	
T65280611	1000	
T65280613	1250	
T65280615	1600	
T65280616	2000	
T65280618	2500	
T65390615	3200	
T65390616	4000	
T65390618	5000	
		 Type 2
T65280620	800	
T65280621	1000	
T65280623	1250	
T65280625	1600	
T65280626	2000	
T65280628	2500	
T65390625	3200	
T65390626	4000	
T65390628	5000	
		 Type 3
T65280630	800	
T65280631	1000	
T65280633	1250	
T65280635	1600	
T65280636	2000	
T65280638	2500	
T65390635	3200	
T65390636	4000	
T65390638	5000	
		 Type 4

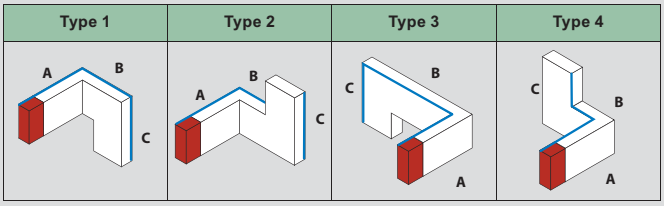
Compact BUSWAYS - HE
elbows (continued)

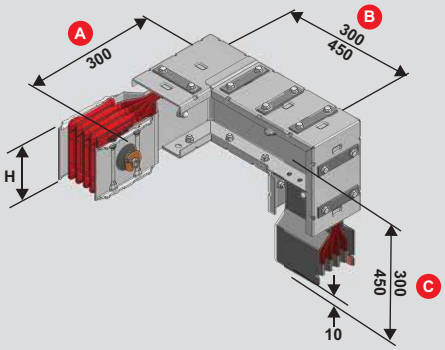
Dimensions

Double elbow horizontal + vertical

Double elbows horizontal + vertical are the union of a horizontal and a vertical elbow, placed in succession starting from the side with Monobloc
Depending on the type of elbows, the double horizontal + vertical elbow may be of four different types:

- Double elbow Horizontal RH + Vertical RH (Type 1)
- Double elbow Horizontal RH + Vertical LH (Type 2)
- Double elbow Horizontal LH + Vertical RH (Type 3)
- Double elbow Horizontal LH + Vertical LH (Type 4)





The dimensions are referred to the standard elements
Single bar (A+B+C): 300+300+300 mm
double bar (A+B+C): 300+450+450 mm

MIN AND MAX DIMENSIONS OF SINGLE AND DOUBLE BAR	
Single bar min/MAX	
A	300/800*
B	300/800*
C	300/800*
Double bar min/MAX	
A	300/800*
B	450/600*
C	450/600*

Dimension H changes with the rating; it is specified in the technical information

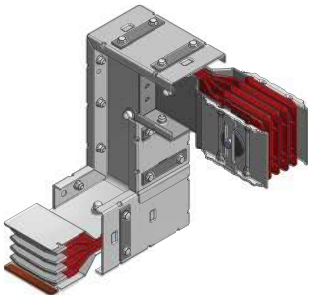
No standard elements "Special" (with measurements that are different from those show in the figure) are referred to the Min and Max dimensions specified in the table

* For all the non standard double H+V elbow (special), it is possible to have only one of the three sides in size exceeding 450 mm
For example, when ordering a horizontal + vertical elbow with size A=650 mm, the B and C size will have to be ≤ 450 mm

Note:
RH - Right
LH - Left

Compact BUSWAYS - HE

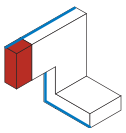
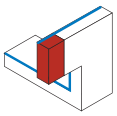
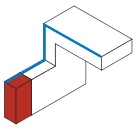
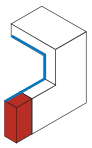
elbows (continued)



T65280506

Cat.Nos

Double elbow vertical + horizontal

Cu	In (A)	Type
T65280500	800	
T65280501	1000	
T65280503	1250	
T65280505	1600	
T65280506	2000	
T65280508	2500	
T65390505	3200	
T65390506	4000	
T65390508	5000	
		 Type 1
T65280510	800	
T65280511	1000	
T65280513	1250	
T65280515	1600	
T65280516	2000	
T65280518	2500	
T65390515	3200	
T65390516	4000	
T65390518	5000	
		 Type 2
T65280520	800	
T65280521	1000	
T65280523	1250	
T65280525	1600	
T65280526	2000	
T65280528	2500	
T65390525	3200	
T65390526	4000	
T65390528	5000	
		 Type 3
T65280530	800	
T65280531	1000	
T65280533	1250	
T65280535	1600	
T65280536	2000	
T65280538	2500	
T65390535	3200	
T65390536	4000	
T65390538	5000	
		 Type 4

Compact BUSWAYS - HE

elbows (continued)

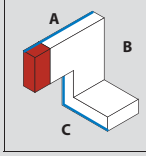
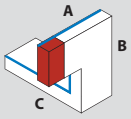
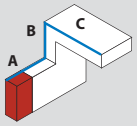
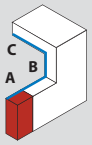
Dimensions

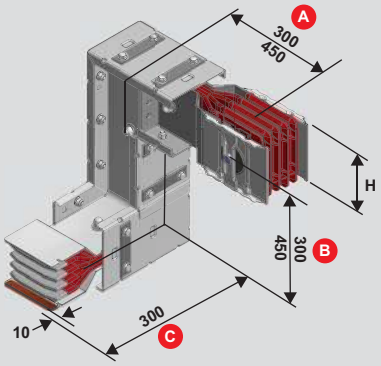
Double elbow vertical + horizontal

Double elbows vertical + horizontal are the union of a vertical and a horizontal elbow, placed in succession starting from the side with Monobloc

Depending on the type of elbows, the double vertical + horizontal elbow may be of four different types:

- Double elbow vertical RH + horizontal RH (Type 1)
- Double elbow vertical RH + horizontal LH (Type 2)
- Double elbow vertical LH + horizontal RH (Type 3)
- Double elbow vertical LH + horizontal LH (Type 4)

Type 1	Type 2	Type 3	Type 4
			



The dimensions are referred to the standard elements.
Single bar (A+B+C): 300+300+300 mm
Double bar (A+B+C): 450+450+300 mm

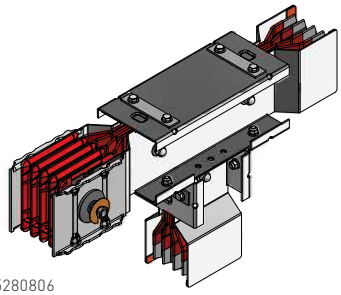
MIN AND MAX DIMENSIONS OF SINGLE AND DOUBLE BAR	
Single bar min/MAX	
A	300/800*
B	300/800*
C	300/800*
Double bar min/MAX	
A	450/600*
B	450/600*
C	300/800*

Dimension H changes with the rating; it is specified in the technical information

No standard elements "Special" (with measurements that are different from those show in the figure) are referred to the Min and Max dimensions specified in the table

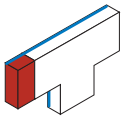
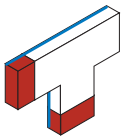
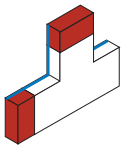
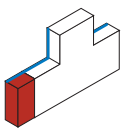
* For all the non standard double V+H elbows (special), it is possible to have only one of the three sides in size exceeding 450 mm
For example, when ordering a double vertical + horizontal elbow with size A=650 mm, the B and C size will have to be ≤ 450 mm

Note:
RH - Right
LH - Left



T65280806

Vertical T element

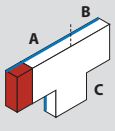
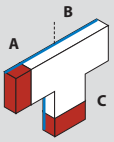
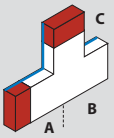
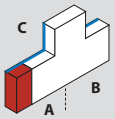
Cat.Nos Cu	In (A)	Type
T65280800	800	 Type 1
T65280801	1000	
T65280803	1250	
T65280805	1600	
T65280806	2000	
T65280808	2500	
T65390805	3200	
T65390806	4000	
T65390808	5000	
T65280810	800	 Type 2
T65280811	1000	
T65280813	1250	
T65280815	1600	
T65280816	2000	
T65280818	2500	
T65390815	3200	
T65390816	4000	
T65390818	5000	
T65280820	800	 Type 3
T65280821	1000	
T65280823	1250	
T65280815	1600	
T65280826	2000	
T65280828	2500	
T65390825	3200	
T65390826	4000	
T65390828	5000	
T65280830	800	 Type 4
T65280831	1000	
T65280833	1250	
T65280835	1600	
T65280836	2000	
T65280838	2500	
T65390835	3200	
T65390836	4000	
T65390838	5000	

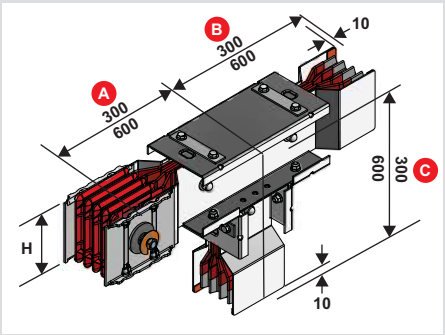
Compact BUSWAYS - HE
T elements

Dimensions

Vertical T element

T-elements can be used to split the line in two branches, adding together the effect of two diverging elbows
There are four types of verticals "T" elements, as shown below

Type 1	Type 2	Type 3	Type 4
			



The dimensions are referred to the standard elements
Single bar (A+B+C): 300+300+300 mm
Double bar (A+B+C): 600+600+600 mm

MIN AND MAX DIMENSIONS OF SINGLE AND DOUBLE BAR	
Single bar min/MAX	
A	300/1400*
B	300/1400*
C	300/700*
Double bar min/MAX	
A	300/1400*
B	300/1400*
C	450/600*

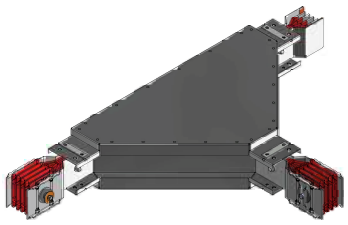
Dimension H changes with the rating; it is specified in the technical information

No standard elements "Special" (with measurements that are different from those show in the figure) are referred to the Min and Max dimensions specified in the table

* For all the non standard Vertical T elements (special), it is possible to have only one of the three sides in size exceeding 600 mm.
For example, when ordering a T vertical element with size A=650 mm, the B and C size will have to be ≤600 mm

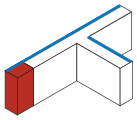
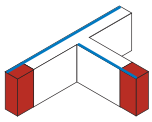
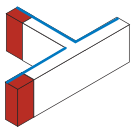
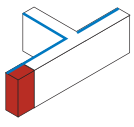
Compact BUSWAYS - HE

T elements (continued)



T65280706

Horizontal T element

Cat.Nos Cu	In (A)	Type
T65280700	800	 Type 1
T65280701	1000	
T65280703	1250	
T65280705	1600	
T65280706	2000	
T65280708	2500	
T65390705	3200	
T65390706	4000	
T65390708	5000	
T65280710	800	 Type 2
T65280711	1000	
T65280713	1250	
T65280715	1600	
T65280716	2000	
T65280718	2500	
T65390715	3200	
T65390716	4000	
T65390718	5000	
T65280720	800	 Type 3
T65280721	1000	
T65280723	1250	
T65280725	1600	
T65280726	2000	
T65280728	2500	
T65390725	3200	
T65390726	4000	
T65390728	5000	
T65280730	800	 Type 4
T65280731	1000	
T65280733	1250	
T65280735	1600	
T65280736	2000	
T65280738	2500	
T65390735	3200	
T65390736	4000	
T65390738	5000	

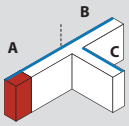
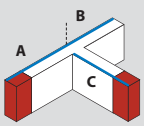
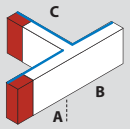
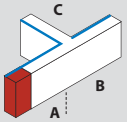
Compact BUSWAYS - HE

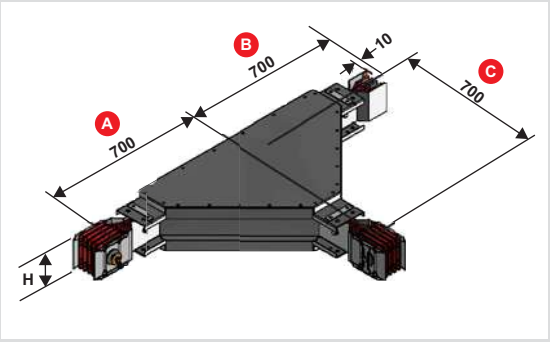
T elements (continued)

Dimensions

Horizontal T element

T-elements can be used to split the line in two branches, adding together the effect of two diverging elbows
There are four types of horizontal "T" elements, as shown below

Type 1	Type 2	Type 3	Type 4
			



The dimensions are referred to the standard elements.
Single/double bar (A+B+C): 600+600+600 mm

MIN AND MAX DIMENSIONS OF SINGLE AND DOUBLE BAR	
Single bar min/MAX	
A	700/700*
B	700/700*
C	700/700*
Double bar min/MAX	
A	700/700*
B	700/700*
C	700/700*

Dimension H changes with the rating; it is specified in the technical information

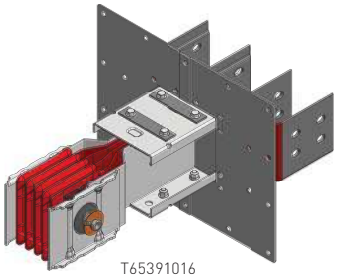
No standard elements "Special" (with measurements that are different from those show in the figure) are referred to the Min and Max dimensions specified in the table

* For all the non standard Horizontal T elements (special), it is possible to have only one of the three sides in size exceeding 600 mm.
For example, when ordering a T horizontal element with size A=650 mm, the B and C size will have to be ≤ 600 mm

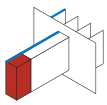
Note:
Only in special cases, where is not possible to use the standard element, is possible to have only one of three arms with minimum dimension of 300mm.
For more information please contact Bahra TBS

Compact BUSWAYS - HE

connection interfaces with exit bars



T65391016

Cat.Nos	Connection interfaces with exit bars		
Cu	In (A)	Type	Type
T65281000	800		
T65281001	1000		
T65281003	1250		
T65281005	1600		Standard
T65281006	2000		
T65281008	2500		
T65391005	3200		
T65391006	4000		
T65391008	5000		
T65281020	800		
T65281021	1000	Right Type 2	
T65281023	1250		
T65281025	1600		Special
T65281026	2000		
T65281028	2500		
T65391025	3200		
T65391026	4000		
T65391028	5000		
T65281010	800		
T65281011	1000		
T65281013	1250		
T65281015	1600		Standard
T65281016	2000		
T65281018	2500		
T65391015	3200		
T65391016	4000		
T65391018	5000	Left Type 1	
T65281030	800		
T65281031	1000		
T65281033	1250		
T65281035	1600		Special
T65281036	2000		
T65281038	2500		
T65391035	3200		
T65391036	4000		
T65391038	5000		

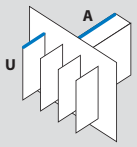
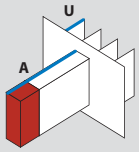
Compact BUSWAYS - HE

connection interfaces with exit bars

Dimensions

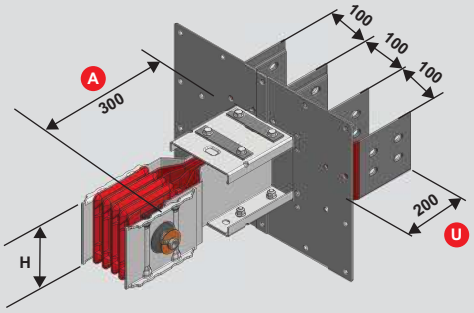
Connection interfaces with exit bars

Standard connection interfaces are used at the end of the lines to connect the busbar to boards or transformers. They are available in the right (without Monobloc) and left (with Monobloc fitted) version. The drawings below refer to the standard versions. Different executions are available on request (e.g.: length, centre distance between bar conductors, drilling, etc.)

Standard connection interface RH (Type 2 without monoblock fitted)	Standard connection interface LH (Type 1 with monoblock fitted)
	

Note:
RH - Right
LH - Left

Standard connection interface



See on page 60 the drawings with all drilling details for dimensions of coverplate (1) and bars (2)

The dimensions are referred to the standard elements.
Single/double bar (U+A):
200+300 mm

MIN AND MAX DIMENSIONS OF SINGLE AND DOUBLE BAR	
Single bar min/MAX	
U	200
A	300/1400
Double bar min/MAX	
U	200
A	300/1400

Dimension H changes with the rating; it is specified in the technical information

No standard elements "Special" (with measurements that are different from those show in the figure) are referred to the Min and Max dimensions specified in the table

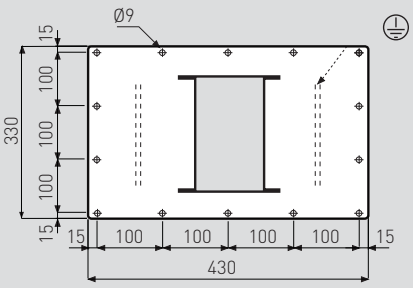
On request is available the busbar connection interface with exit bars for range:

Compact BUSWAYS - HE

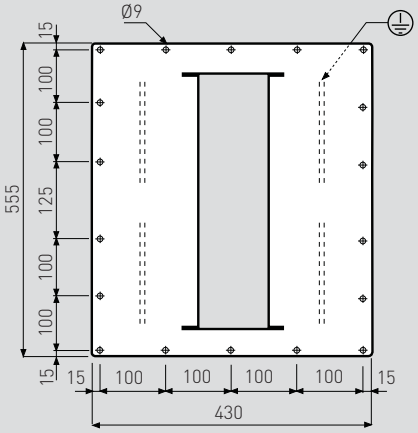
dimensions

Coverplate drilling details (1)

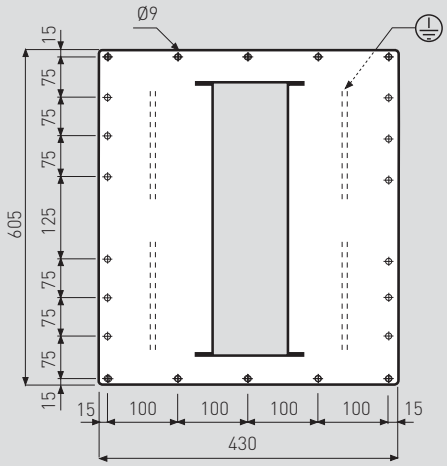
Cu 800A÷2500A



Cu 3200A ÷ 5000A

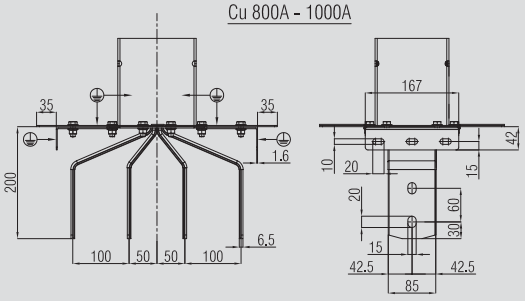


Cu 3200A ÷ 5000A

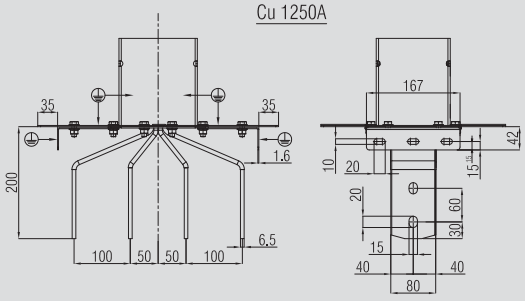


Bar drilling details (2)

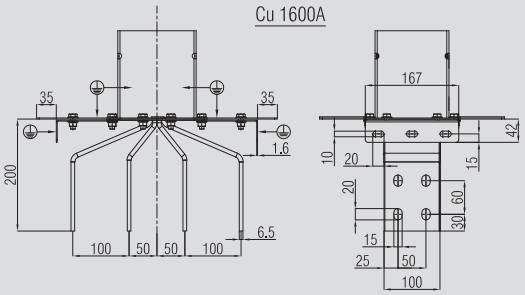
Cu 800A - 1000A



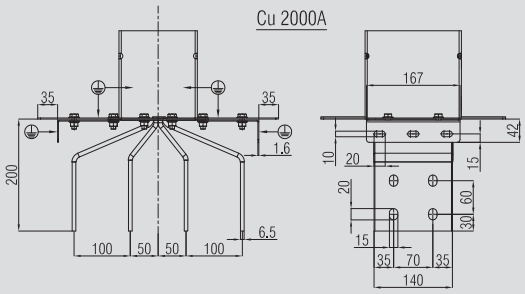
Cu 1250A



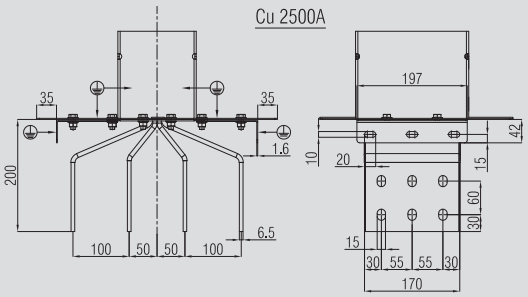
Cu 1600A



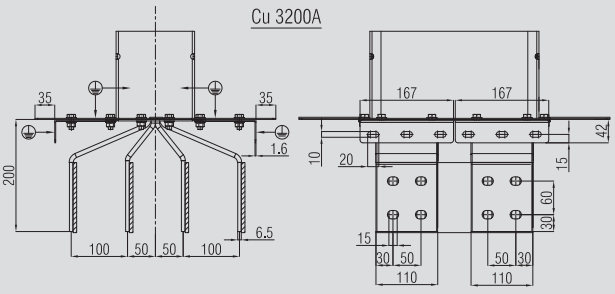
Cu 2000A



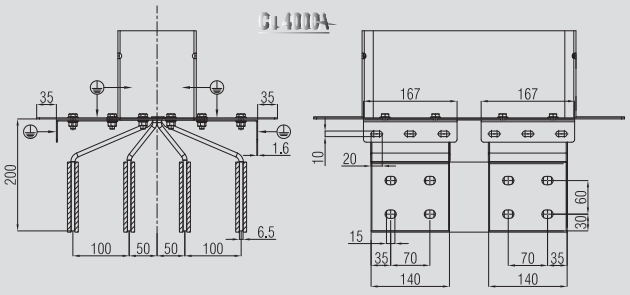
Cu 2500A



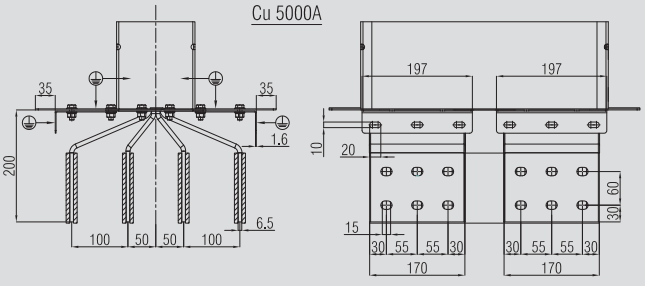
Cu 3200A



Cu 4000A

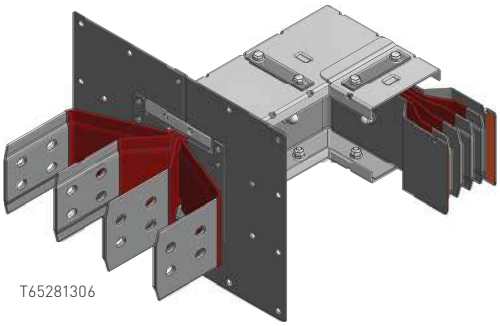


Cu 5000A

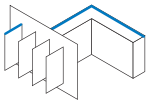
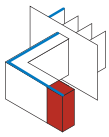
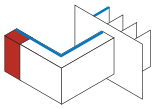


Compact BUSWAYS - HE

connection interfaces with exit bars + horizontal elbow



T65281306

Cat.Nos	Connection interfaces with exit bars + horizontal elbow	
Cu	In (A)	Type
T65281300	800	 Type 1
T65281301	1000	
T65281303	1250	
T65281305	1600	
T65281306	2000	
T65281308	2500	
T65391305	3200	
T65391306	4000	
T65391308	5000	
T65281310	800	 Type 2
T65281311	1000	
T65281313	1250	
T65281315	1600	
T65281316	2000	
T65281318	2500	
T65391315	3200	
T65391316	4000	
T65391318	5000	
T65281320	800	 Type 3
T65281321	1000	
T65281323	1250	
T65281325	1600	
T65281326	2000	
T65281328	2500	
T65391325	3200	
T65391326	4000	
T65391328	5000	
T65281330	800	 Type 4
T65281331	1000	
T65281333	1250	
T65281335	1600	
T65281336	2000	
T65281338	2500	
T65391335	3200	
T65391336	4000	
T65391338	5000	

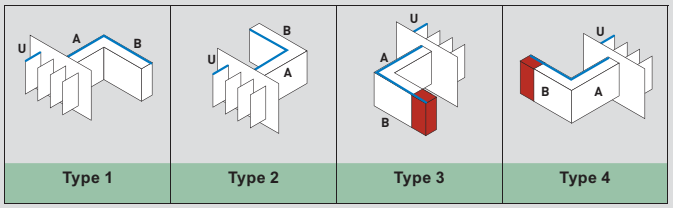
Compact BUSWAYS - HE

connection interfaces with exit bars + horizontal elbow

Dimensions

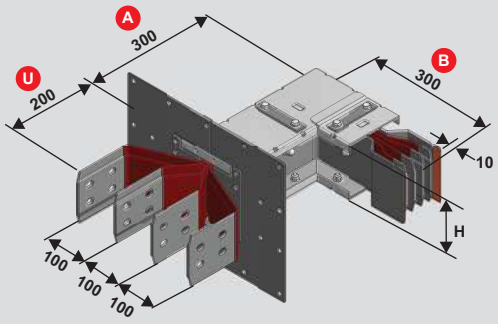
Connection interfaces with exit bars + horizontal elbow

This element is the union of a connection interface with exit bars and a horizontal elbow



The dimensions are referred to the standard elements

Single/double bar (U+A+B): 200+300+300 mm



MIN AND MAX DIMENSIONS OF SINGLE AND DOUBLE BAR	
Single bar min/MAX	
U	200
A	300/1000*
B	300/1000*
Double bar min/MAX	
U	200
A	300/1000*
B	300/1000*

See on page 60 the drawings with all drilling details for dimensions of coverplate (1) and bars (2)

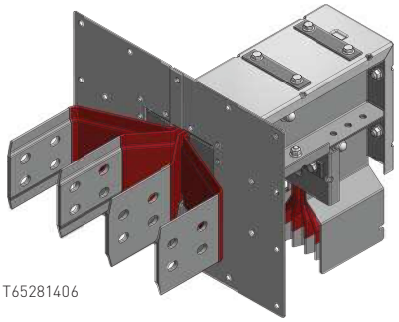
Dimension H changes with the rating; it is specified in the technical information

No standard elements "Special" (with measurements that are different from those show in the figure) are referred to the Min and Max dimensions specified in the table

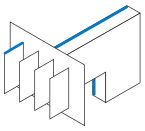
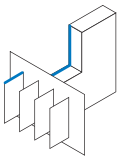
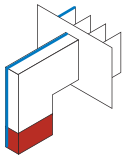
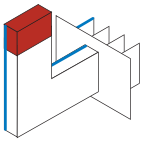
* For all the non standard connection interface with exit bars + horizontal elbows (special), it is possible to have only one of the two sides in size exceeding 600 mm
For example, when ordering an interface with exit bars + horizontal elbow with size A=650 mm, the B size will have to be ≤ 600 mm

Compact BUSWAYS - HE

connection interfaces with exit bars + vertical elbow



T65281406

Cat.Nos	Connection interfaces with exit bars + vertical elbow	
Cu	In (A)	Type
T65281400	800	 Type 1
T65281401	1000	
T65281403	1250	
T65281405	1600	
T65281406	2000	
T65281408	2500	
T65391405	3200	
T65391406	4000	
T65391408	5000	
T65281410	800	 Type 2
T65281411	1000	
T65281413	1250	
T65281415	1600	
T65281416	2000	
T65281418	2500	
T65391415	3200	
T65391416	4000	
T65391418	5000	
T65281420	800	 Type 3
T65281421	1000	
T65281423	1250	
T65281425	1600	
T65281426	2000	
T65281428	2500	
T65391425	3200	
T65391426	4000	
T65391428	5000	
T65281430	800	 Type 4
T65281431	1000	
T65281433	1250	
T65281435	1600	
T65281436	2000	
T65281438	2500	
T65391435	3200	
T65391436	4000	
T65391438	5000	

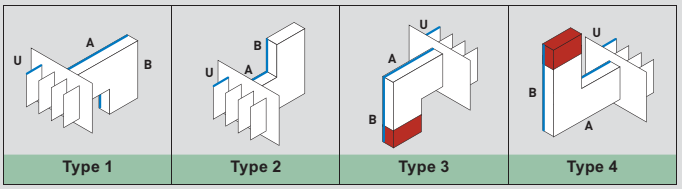
Compact BUSWAYS - HE

connection interfaces with exit bars + vertical elbow

Dimensions

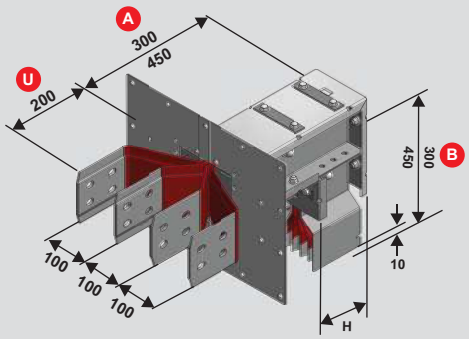
Connection interfaces with exit bars + vertical elbow

This element is the union of a connection interface with exit bars and a vertical elbow



The dimensions are referred to the standard elements

Single bar (U+A+B): 200+300+300 mm
Double bar (U+A+B): 200+450+450 mm



MIN AND MAX DIMENSIONS OF SINGLE AND DOUBLE BAR	
Single bar min/MAX	
U	200
A	300/1400*
B	300/1400*
Double bar min/MAX	
U	200
A	450/1000*
B	450/1000*

See on page 60 the drawings with all drilling details for dimensions of coverplate (1) and bars (2)

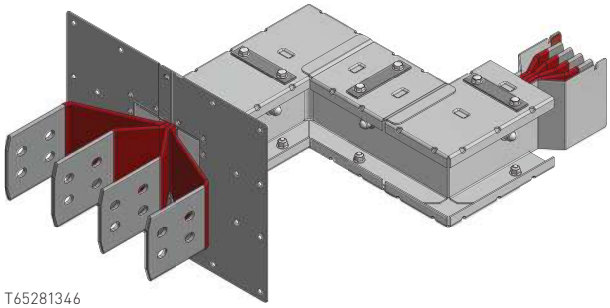
Dimension H changes with the rating; it is specified in the technical information

No standard elements "Special" (with measurements that are different from those show in the figure) are referred to the Min and Max dimensions specified in the table

* For all the non standard connection interface with exit bars + vertical elbows (special), it is possible to have only one of the two sides in size exceeding 600 mm
For example, when ordering an interface with exit bars + vertical elbow with size A=650 mm, the B size will have to be ≤ 600 mm

Compact BUSWAYS - HE

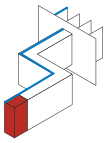
connection interfaces with exit bars + double horizontal elbow



T65281346

Cat.Nos

Connection interfaces with exit bars + double horizontal elbow

Cu	In (A)	Type
T65281340	800	
T65281341	1000	
T65281343	1250	
T65281345	1600	
T65281346	2000	
T65281348	2500	
T65391345	3200	
T65391346	4000	
T65391348	5000	
		 Type 1
T65281350	800	
T65281351	1000	
T65281353	1250	
T65281355	1600	
T65281356	2000	
T65281358	2500	
T65391355	3200	
T65391356	4000	
T65391358	5000	
		 Type 2
T65281360	800	
T65281361	1000	
T65281363	1250	
T65281365	1600	
T65281366	2000	
T65281368	2500	
T65391365	3200	
T65391366	4000	
T65391368	5000	
		 Type 3
T65281370	800	
T65281371	1000	
T65281373	1250	
T65281375	1600	
T65281376	2000	
T65281378	2500	
T65391375	3200	
T65391376	4000	
T65391378	5000	
		 Type 4

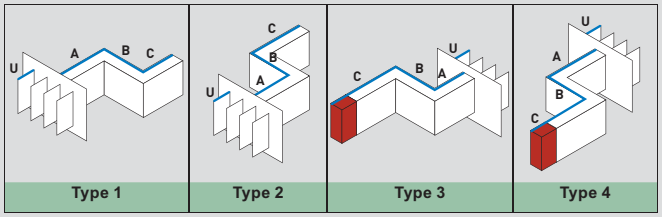
Compact BUSWAYS - HE

connection interfaces with exit bars + double horizontal elbow

Dimensions

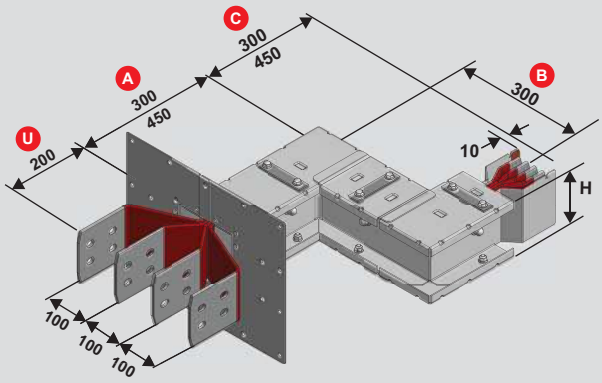
Connection interfaces with exit bars + double horizontal elbow

This element is the union of a connection interface with exit bars and a two horizontal elbows



The dimensions are referred to the standard elements

Single bar (U+A+B+C): 200+300+300+300 mm
Double bar (U+A+B+C): 200+450+300+450 mm



MIN AND MAX DIMENSIONS OF SINGLE AND DOUBLE BAR	
Single bar min/MAX	
U	200
A	300/1000
B	300/1000
C	300/700
Double bar min/MAX	
U	200
A	300/1000
B	300/1000
C	300/700

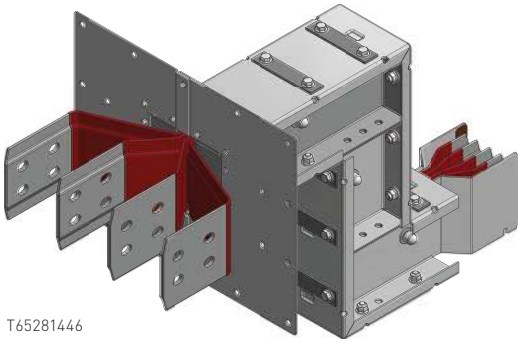
See on page 60 the drawings with all drilling details for dimensions of coverplate (1) and bars (2)

Dimension H changes with the rating; it is specified in the technical information

No standard elements "Special" (with measurements that are different from those show in the figure) are referred to the Min and Max dimensions specified in the table

Compact BUSWAYS - HE

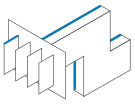
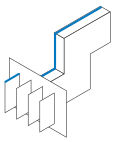
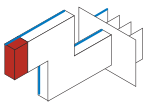
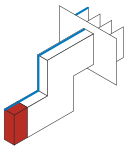
connection interfaces with exit bars + double vertical elbow



T65281446

Cat.Nos

Connection interfaces with exit bars + double vertical elbow

Cu	In (A)	Type
T65281440	800	 Type 1
T65281441	1000	
T65281443	1250	
T65281445	1600	
T65281446	2000	
T65281448	2500	
T65391445	3200	
T65391446	4000	
T65391448	5000	
T65281450	800	 Type 2
T65281451	1000	
T65281453	1250	
T65281455	1600	
T65281456	2000	
T65281458	2500	
T65391455	3200	
T65391456	4000	
T65391458	5000	
T65281460	800	 Type 3
T65281461	1000	
T65281463	1250	
T65281465	1600	
T65281466	2000	
T65281468	2500	
T65391465	3200	
T65391466	4000	
T65391468	5000	
T65281470	800	 Type 4
T65281471	1000	
T65281473	1250	
T65281475	1600	
T65281476	2000	
T65281478	2500	
T65391475	3200	
T65391476	4000	
T65391478	5000	

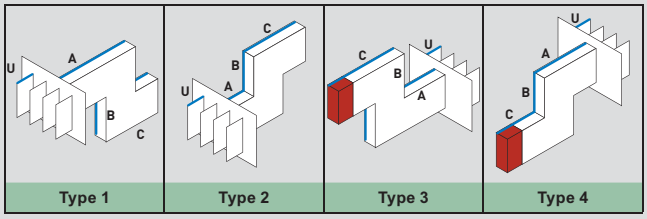
Compact BUSWAYS - HE

connection interfaces with exit bars + double vertical elbow

Dimensions

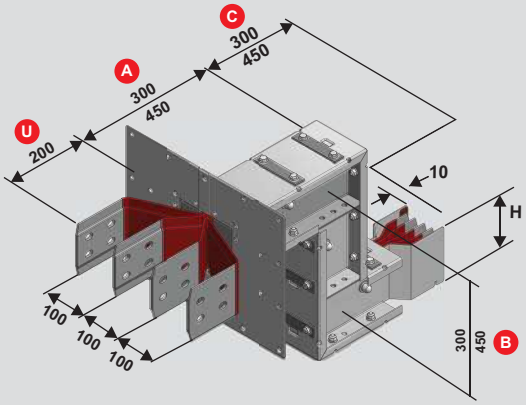
Connection interfaces with exit bars + double vertical elbow

This element is the union of a connection interface with exit bars and a two vertical elbows



The dimensions are referred to the standard elements

Single bar (U+A+B+C): 200+300+300+300 mm
Double bar (U+A+B+C): 200+450+450+450 mm



MIN AND MAX DIMENSIONS OF SINGLE AND DOUBLE BAR	
Single bar min/MAX	
U	200
A	300/1000
B	300/1000
C	300/1000
Double bar min/MAX	
U	200
A	300/1000*
B	450/900*
C	450/900*

See on page 60 the drawings with all drilling details for dimensions of coverplate (1) and bars (2)

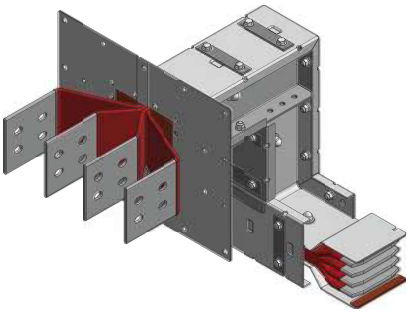
Dimension H changes with the rating; it is specified in the technical information

No standard elements "Special" (with measurements that are different from those show in the figure) are referred to the Min and Max dimensions specified in the table

* For all the non standard connection interface with exit bars + double vertical elbows (special), it is possible to have only one of the three sides in size exceeding 600 mm
For example, when ordering a connection interface with exit bars + double vertical elbow with size C=650 mm, the A and B size will have to be ≤600 mm

Compact BUSWAYS - HE

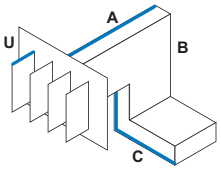
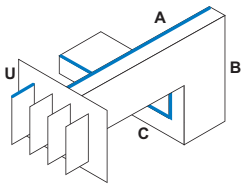
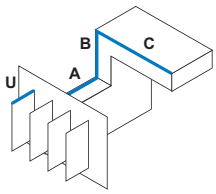
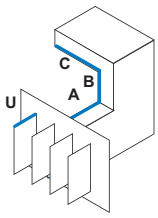
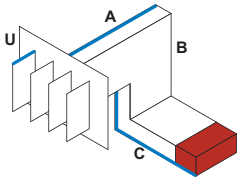
connection interfaces with exit bars + vertical elbow + horizontal elbow



T65281506

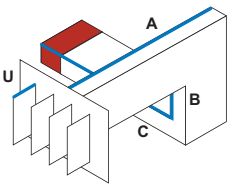
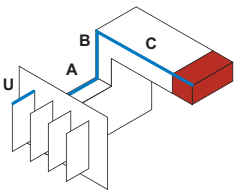
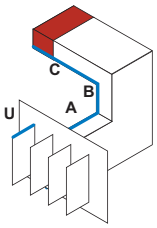
Cat.Nos

Connection interfaces with exit bars + vertical elbow + horizontal elbow

Cu	In (A)	Type
T65281500	800	
T65281501	1000	
T65281503	1250	
T65281505	1600	
T65281506	2000	
T65281508	2500	
T65391505	3200	
T65391506	4000	
T65391508	5000	Type 1
T65281510	800	
T65281511	1000	
T65281513	1250	
T65281515	1600	
T65281516	2000	
T65281518	2500	
T65391515	3200	
T65391516	4000	
T65391518	5000	Type 2
T65281520	800	
T65281521	1000	
T65281523	1250	
T65281525	1600	
T65281526	2000	
T65281528	2500	
T65391525	3200	
T65391526	4000	
T65391528	5000	Type 3
T65281530	800	
T65281531	1000	
T65281533	1250	
T65281535	1600	
T65281536	2000	
T65281538	2500	
T65391535	3200	
T65391536	4000	
T65391538	5000	Type 4
T65281540	800	
T65281541	1000	
T65281543	1250	
T65281545	1600	
T65281546	2000	
T65281548	2500	
T65391545	3200	
T65391546	4000	
T65391548	5000	Type 5

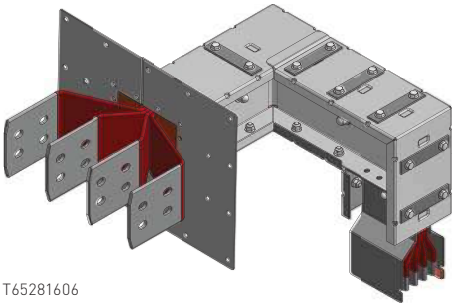
Cat.Nos

Connection interfaces with exit bars + vertical elbow + horizontal elbow

Cu	In (A)	Type
T65281550	800	
T65281551	1000	
T65281553	1250	
T65281555	1600	
T65281556	2000	
T65281558	2500	
T65391555	3200	
T65391556	4000	
T65391558	5000	Type 6
T65281560	800	
T65281561	1000	
T65281563	1250	
T65281565	1600	
T65281566	2000	
T65281568	2500	
T65391565	3200	
T65391566	4000	
T65391568	5000	Type 7
T65281570	800	
T65281571	1000	
T65281573	1250	
T65281575	1600	
T65281576	2000	
T65281578	2500	
T65391575	3200	
T65391576	4000	
T65391578	5000	Type 8

Compact BUSWAYS - HE

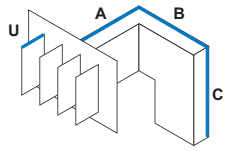
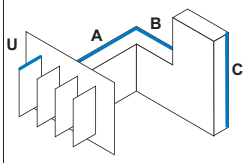
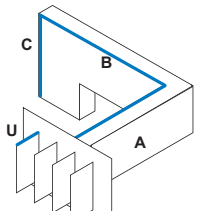
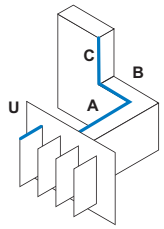
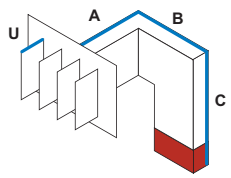
connection interfaces with exit bars + horizontal elbow + vertical elbow



T65281606

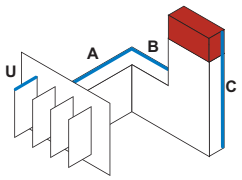
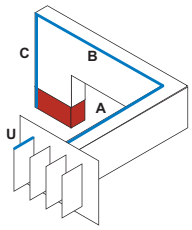
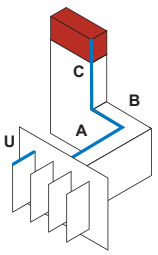
Cat.Nos

Connection interfaces with exit bars + horizontal elbow + vertical elbow

Cu	In (A)	Type
T65281600	800	 Type 1
T65281601	1000	
T65281603	1250	
T65281605	1600	
T65281606	2000	
T65281608	2500	
T65391605	3200	
T65391606	4000	
T65391608	5000	
T65281610	800	 Type 2
T65281611	1000	
T65281613	1250	
T65281615	1600	
T65281616	2000	
T65281618	2500	
T65391615	3200	
T65391616	4000	
T65391618	5000	
T65281620	800	 Type 3
T65281621	1000	
T65281623	1250	
T65281625	1600	
T65281626	2000	
T65281628	2500	
T65391625	3200	
T65391626	4000	
T65391628	5000	
T65281630	800	 Type 4
T65281631	1000	
T65281633	1250	
T65281635	1600	
T65281636	2000	
T65281638	2500	
T65391635	3200	
T65391636	4000	
T65391638	5000	
T65281640	800	 Type 5
T65281641	1000	
T65281643	1250	
T65281645	1600	
T65281646	2000	
T65281648	2500	
T65391645	3200	
T65391646	4000	
T65391648	5000	

Cat.Nos

Connection interfaces with exit bars + horizontal elbow + vertical elbow

Cu	In (A)	Type
T65281650	800	 Type 6
T65281651	1000	
T65281653	1250	
T65281655	1600	
T65281656	2000	
T65281658	2500	
T65391655	3200	
T65391656	4000	
T65391658	5000	
T65281660	800	 Type 7
T65281661	1000	
T65281663	1250	
T65281665	1600	
T65281666	2000	
T65281668	2500	
T65391665	3200	
T65391666	4000	
T65391668	5000	
T65281670	800	 Type 8
T65281671	1000	
T65281673	1250	
T65281675	1600	
T65281676	2000	
T65281678	2500	
T65391675	3200	
T65391676	4000	
T65391678	5000	

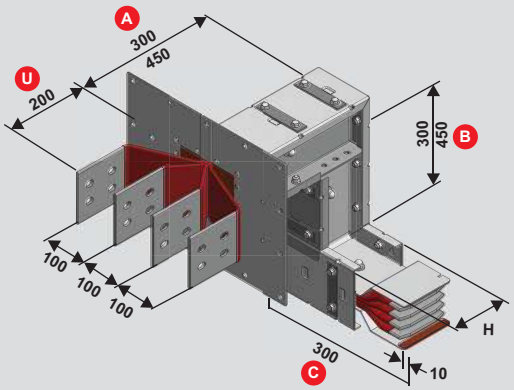
Compact BUSWAYS - HE

connection interfaces with exit bars + vertical elbow + horizontal elbow

Dimensions

Connection interfaces with exit bars + vertical elbow + horizontal elbow

This element is the union of a connection interface with exit bars and a vertical and horizontal elbow



The dimensions are referred to the standard elements.
Single bar (U+A+B+C):
200+300+300+300 mm
Double bar (U+A+B+C):
200+450+450+300 mm

MIN AND MAX DIMENSIONS OF SINGLE AND DOUBLE BAR	
Single bar min/MAX	
U	200
A	300/600
B	300/800
C	300/800
Double bar min/MAX	
U	200
A	450/450*
B	450/450*
C	300/800*

See on page 60 the drawings with all drilling details for dimensions of coverplate (1) and bars (2)

Dimension H changes with the rating; it is specified in the technical information

No standard elements "Special" (with measurements that are different from those show in the figure) are referred to the Min and Max dimensions specified in the table

* For all the non standard connection interface with exit bars + vertical elbows + horizontal elbow (special), it is possible to have only one of the three sides in size exceeding 450 mm. For example, when ordering a connection interface with exit bars + vertical elbow + horizontal elbow with size C=650 mm, the A and B size will have to be ≤ 450 mm

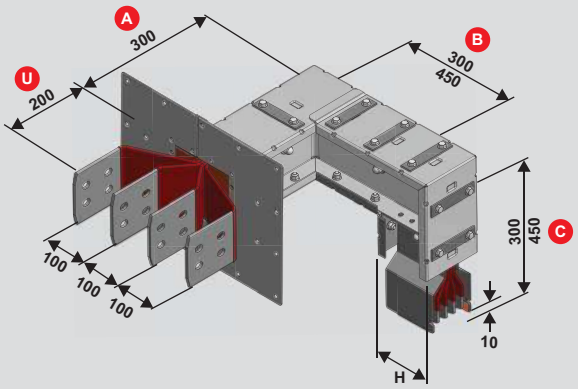
Compact BUSWAYS - HE

connection interfaces with exit bars + horizontal elbow + vertical elbow

Dimensions

Connection interfaces with exit bars + horizontal elbow + vertical elbow

This element is the union of a connection interface with exit bars and a horizontal and vertical elbow



The dimensions are referred to the standard elements.
Single bar (U+A+B+C):
200+300+300+300 mm
Double bar (U+A+B+C):
200+300+450+450 mm

MIN AND MAX DIMENSIONS OF SINGLE AND DOUBLE BAR	
Single bar min/MAX	
U	200
A	300/800
B	300/800
C	300/800
Double bar min/MAX	
U	200
A	300/800*
B	450/450*
C	450/450*

See on page 60 the drawings with all drilling details for dimensions of coverplate (1) and bars (2)

Dimension H changes with the rating; it is specified in the technical information

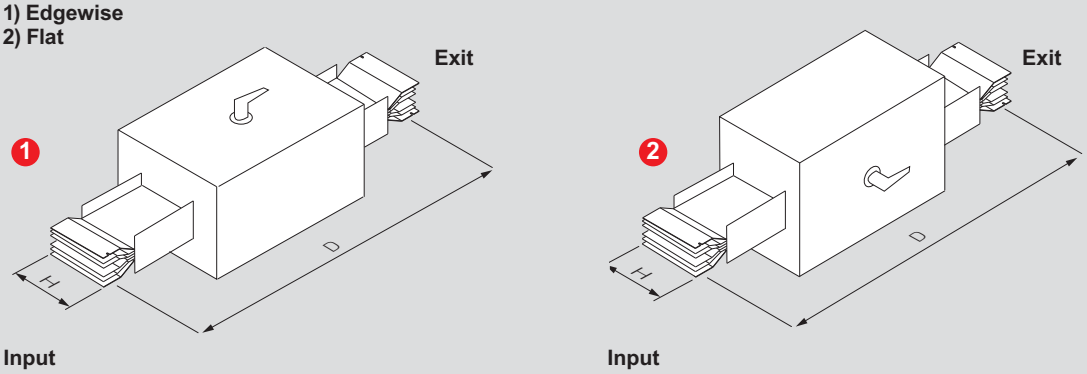
No standard elements "Special" (with measurements that are different from those show in the figure) are referred to the Min and Max dimensions specified in the table.

* For all the non standard connection interface with exit bars + horizontal elbow + vertical elbow (special), it is possible to have only one of the three sides in size exceeding 450 mm. For example, when ordering a connection interface with exit bars + horizontal elbow + vertical elbow with size C=650 mm, the A and B size will have to be ≤ 450 mm

SELECTION ISOLATOR AND RATE REDUCER WITH ISOLATOR SWITCH

The type of route:

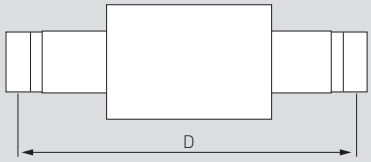
1) Edgewise
2) Flat



Dimension H changes with the rating; it is specified in the technical information

Rate Reducer

Input
From 800 A to 6300 A
(Cu)



Exit
From 800 A to 1250 A
From 1600 A to 2500 A
(Cu)

EXIT	D
From 800 A to 1250 A	1500
From 1600 A to 2500 A	2000

Fuses not included. See general Bahra TBS catalogue

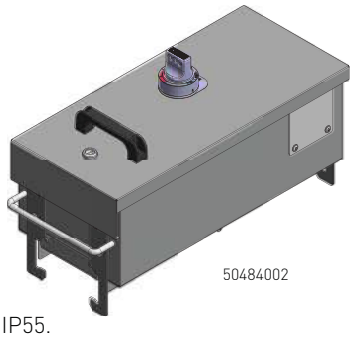
Note:- Reducer available with / without(1) overcurrent Protection.

(1) As per NEC 364-10, Omission of overcurrent protection shall be permitted at points where busways are reduced in ampacity, provided that the length of the busway having the smaller ampacity does not exceed 15 m (50 ft) and has an ampacity at least equal to one-third the rating or setting of the overcurrent device next back on the line.

Please contact Bahra TBS for more details on the dimensions

Compact BUSWAYS - HE

METAL tap-off box Type 1 - 63 A to 160 A : plug-in type



IP55.
Equipped with a sectioning cover. It can be installed and removed when the busbar is energized.
To be applied on elements with any rating, with tap-off outlets.
These are the smallest metal tap-off boxes available and its rating goes from 63 A to 160 A.

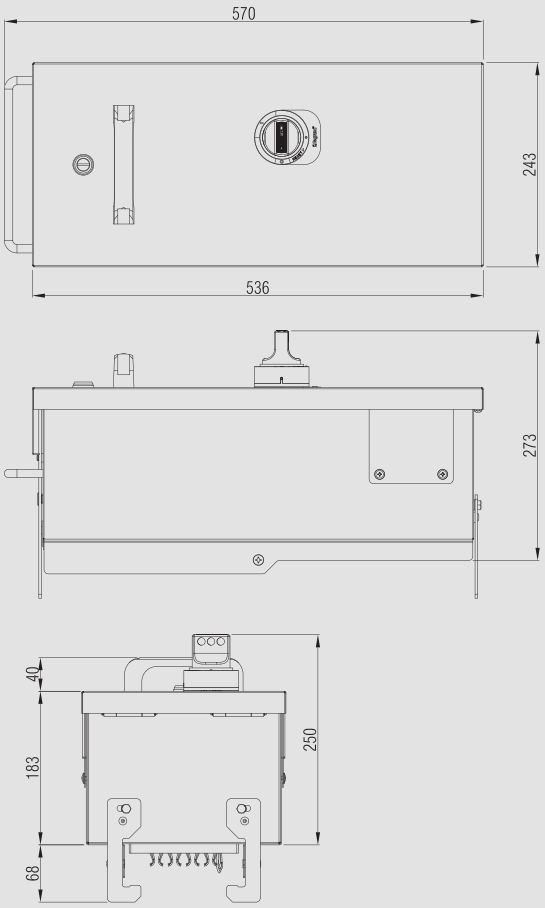
Item	Tap-off boxes DPX³ ready	
	Prepared for MCCB (not provided) and available in 2 versions, one with hinged cover and one with completely removable cover.	In (A)
50481721		63/125/160 A
50481731		63/125/160 A - removable cover

Dimensions

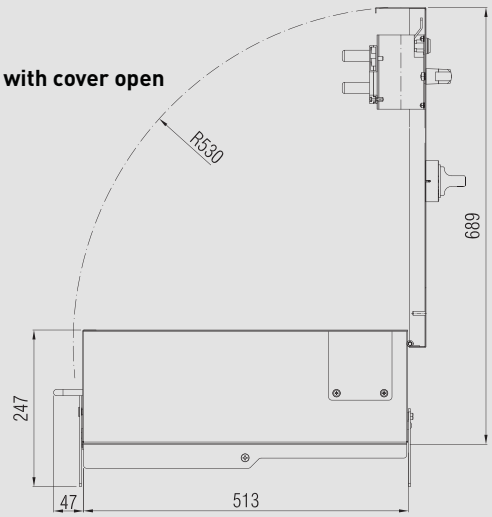
Type 1 - 160 A

Box dimensions (mm)

DPX³ ready

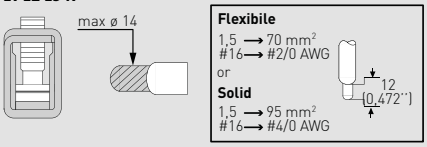


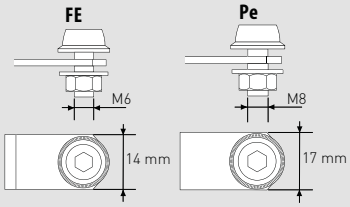
Total dimensions with cover open



Terminal dimensions type 1 - DPX ³ ready (mm)

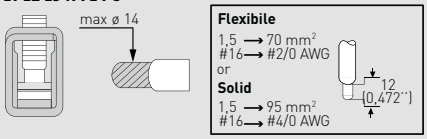
L1 L2 L3 N





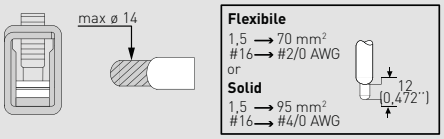
Terminal dimensions type 1 - empty (mm)

L1 L2 L3 N FE Pe

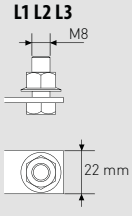


Terminal dimensions type 1 - fuse carriers (mm)

N FE Pe

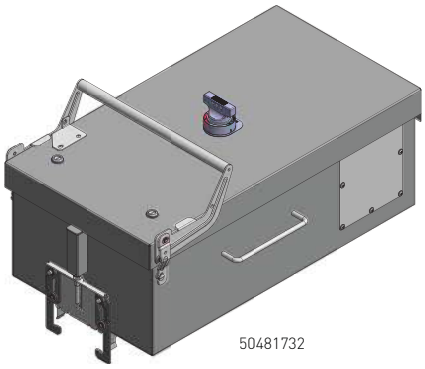


L1 L2 L3



Compact BUSWAYS - HE

METAL tap-off box Type 2 - 250 A: plug-in type



IP55.
Equipped with a sectioning cover. It can be installed and removed when the busbar is energized.
To be applied on elements with any rating, with tap-off outlets.
These are the medium size metal tap-off boxes available and its rating is 250 A.

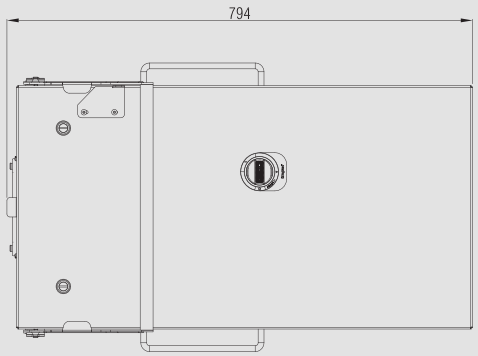
Item	Tap-off boxes DPX³ ready
	Prepared for Bahra TBS MCCB (not provided) and available in 2 versions, one with hinged cover and one with completely removable cover.
	In (A)
50481722	250 A
50481724	250 A - DRXHP ready
50481732	250 A - removable cover
50481734	250 A - DRXHP ready removable cover

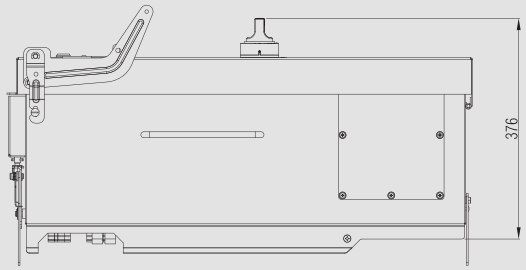
Dimensions

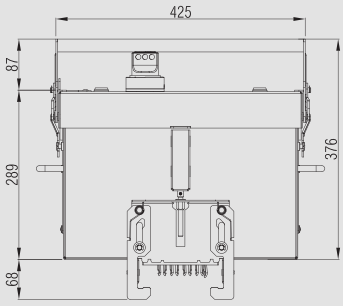
Type 2 - 250A & 630A

Box dimensions (mm)

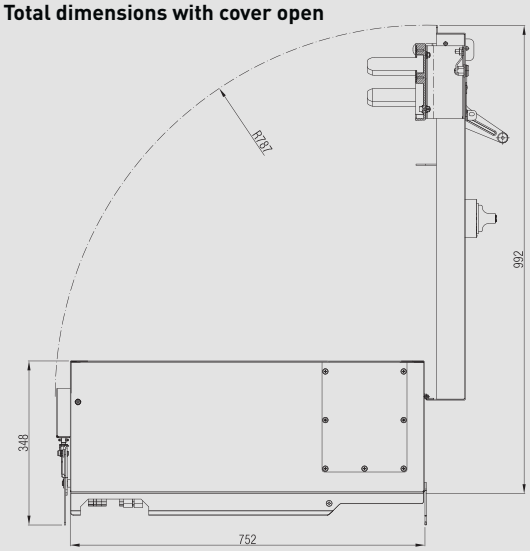
DPX³ ready





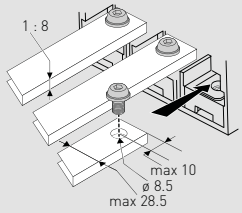


Total dimensions with cover open



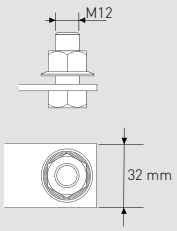
Terminal dimensions type 2 DPX³ ready and empty (mm)

L1 L2 L3 N FE Pe



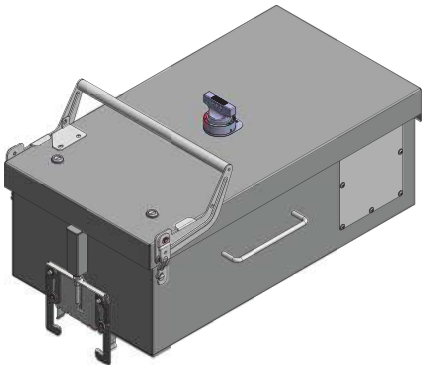
Terminal dimensions type 2 fuse carriers (mm)

L1 L2 L3 N FE Pe



Compact BUSWAYS - HE

METAL tap-off box Type 3 - 400 A to 630 A : plug-in type



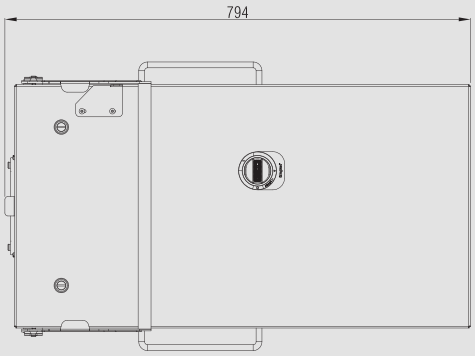
50481733

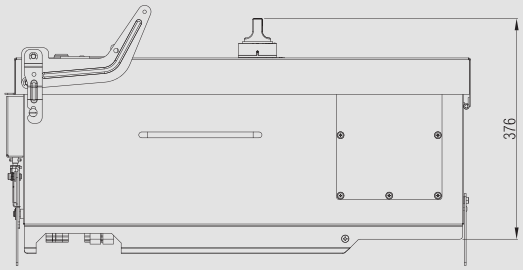
IP55.
Equipped with a sectioning cover. It can be installed and removed when the busbar is energized.
To be applied on elements with any rating, with tap-off outlets.
These are the largest size metal tap-off boxes available and its rating is 400 A or 630 A.

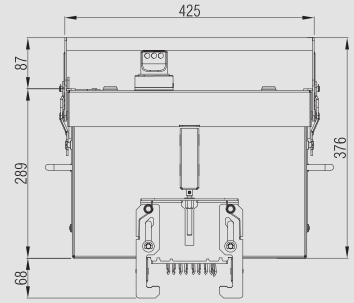
Item	Tap-off boxes DPX³ ready
	Prepared for Bahra TBS MCCB (not provided) and available in 2 versions, one with hinged cover and one with completely removable cover.
	In (A)
50481723	400/630 A - DPX³ ready
50481733	400/630 A - DPX³ ready removable cover

Dimensions

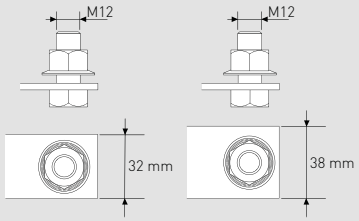
Type 3 (400 - 630 A)
Box dimensions (mm)
DPX³ ready



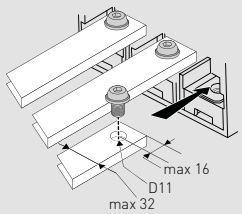




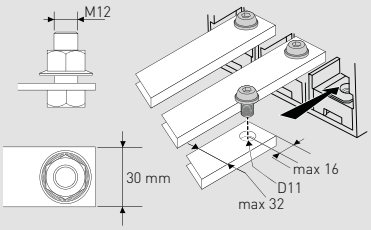
Terminal dimensions type 3 - fuse carriers (mm)



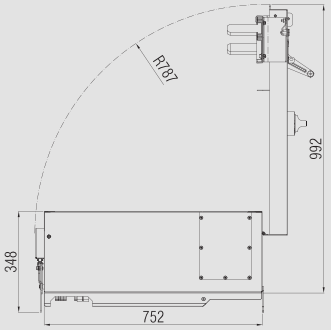
Terminal dimensions type 3 - empty (mm)



Terminal dimensions type 3 - DPX³ ready (mm)

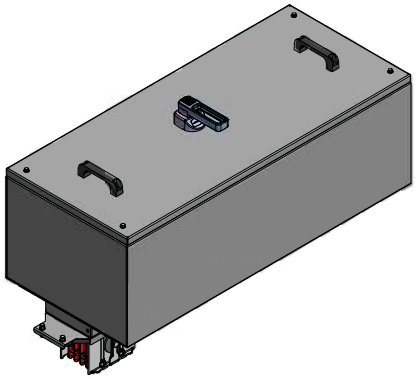


Total dimensions with cover open



Compact BUSWAYS - HE

tap-off box on the junction - 800 A to 1250 A: bolt-on type



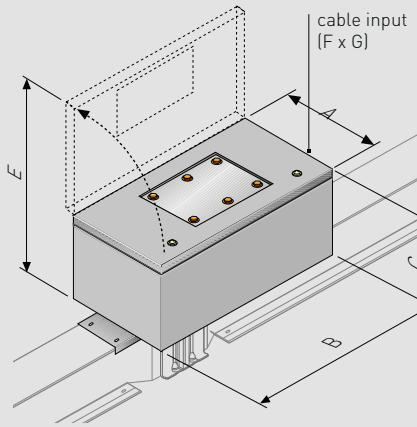
67281931P

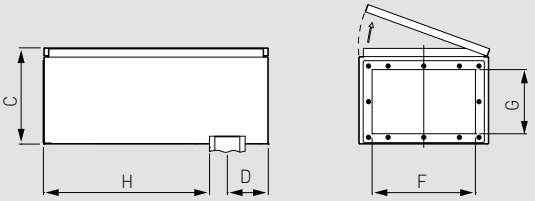
Item	Empty Tap-off boxes bolt-on TYPE
	IP55 Can be installed on elements with any rating, with or without tap-off outlets
	Description
67281931P	Bolt on box empty for 120 mm single bar
67281932P	Bolt on box empty for 160 mm single bar
67281933P	Bolt on box empty for 190 mm single bar
67281934P	Bolt on box empty for 210 mm single bar
67391931P	Bolt on box empty for 2 x 120 mm bars
67391932P	Bolt on box empty for 2 x 160 mm bars
67391933P	Bolt on box empty for 2 x 190 mm bars
67391934P	Bolt on box empty for 2 x 210 mm bars

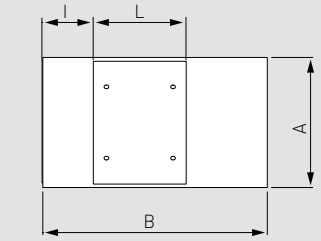
Please contact Bahra TBS for more details on the dimensions

Dimensions

From 125 A to 1250 A



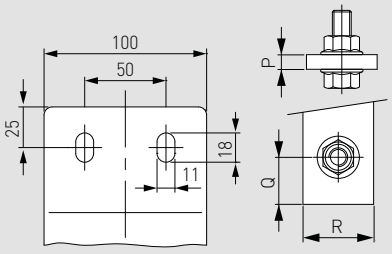




H - Usable internal space
L - Metal internal plate

In (A)	A	B	C	D	E	F	G	H	I	L
125										
250	365	630	270	115	630	290	180	465	142	260
400										
630	400	750	280	115	675	290	180	585	227	295
800										
1000	450	1050	300	115	745	380	210	885	254	545
1250										

Terminal dimensions (mm)



Phase/Neutral terminal
Thread M8

Earth Terminal

Type	In (A)	Earth Terminal			
		P	Q	R	Thread
5A	125	3.3	20	30	M8
	250	3.3	20	30	M8
	400	3.3	20	30	M8
5B	630	5.3	20	30	M8
5C	800	6.2	20	30	M8
	1000	6.2	20	30	M8
	1250	6.2	20	30	M8

WARNING

The bolted boxes are to be installed when the busbar is disconnected and not energized

In order to finalize the Bolt on box, it is necessary to specify the Busway rating in which the box will installed on.

Tap-off boxes can be pre-equipped with DPX moulded case circuit breakers (MCCB) upon request

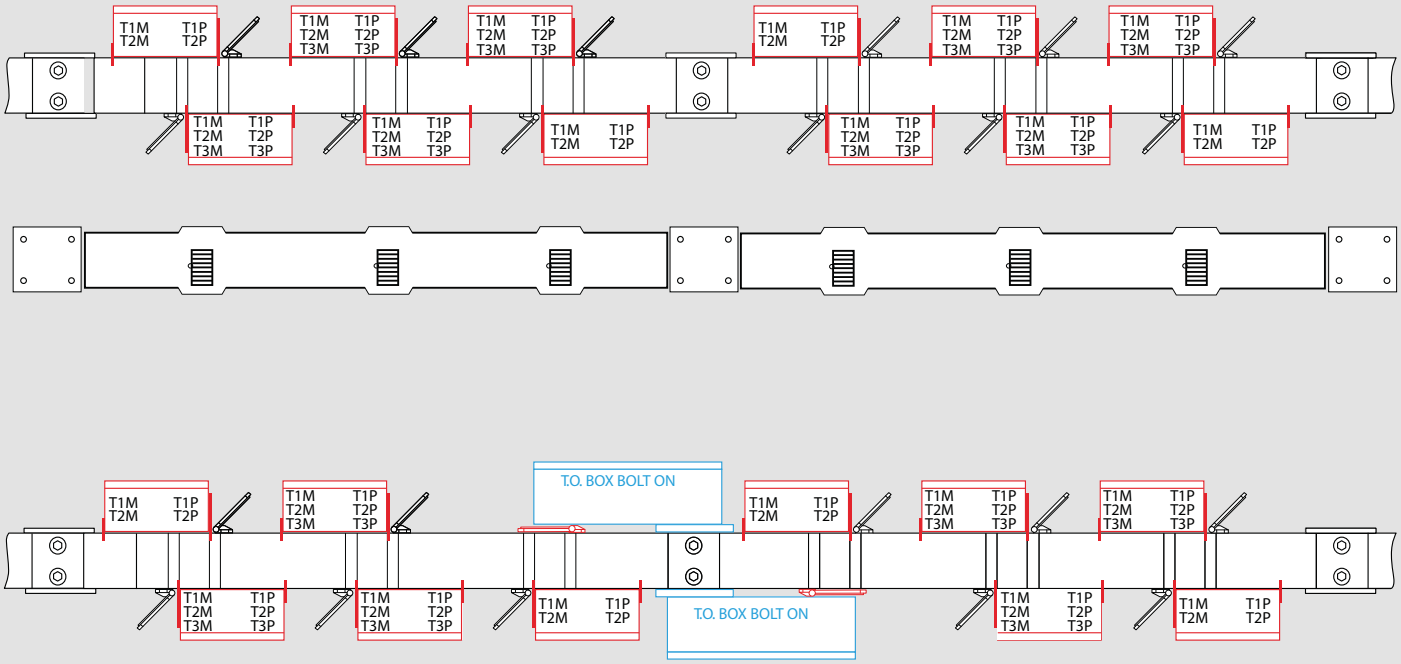
Tap-off box installation

example diagram

Technical informations

Not all boxes can be installed in any position

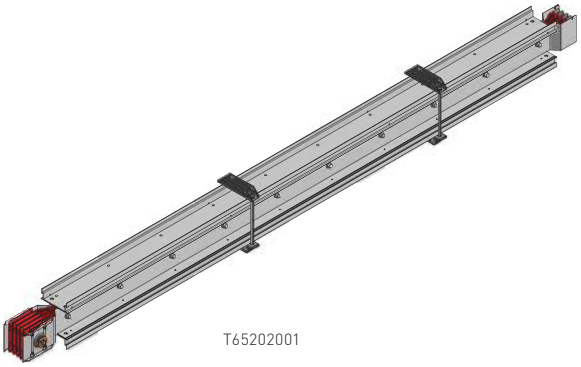
The following figures show where the various Plug-in/Bolt-on boxes may be installed on elements with standard setup



T1/T2/T3: type of tap-off box
M: metal tap-off box
P: fiberglass plastic tap-off box

Compact BUSWAYS - HE

brackets



T65202001

The brackets enable sturdy installation of the busbar to the system support structures
The recommended installation distance between brackets is 1.5 metres
Bahra TBS offers suitable bracket solutions certified for any type of installation, even in the most difficult environments:
- installations subjected to strong vibrations;
- installation in seismic environments

Suspension Brackets

Cat.Nos Cu	In (A)	Type
T65202001	800-1250	edgewise
T65202002	1600	
T65202002	2000	
T65202003	2500	
T65222001	3200	
T65222002	4000	
T65222003	5000	
T65202001	800-250	flat
T65202013	1600-2000	
T65202013	2500	
T65202111	3200	
T65202112	4000	
T65202113	5000	

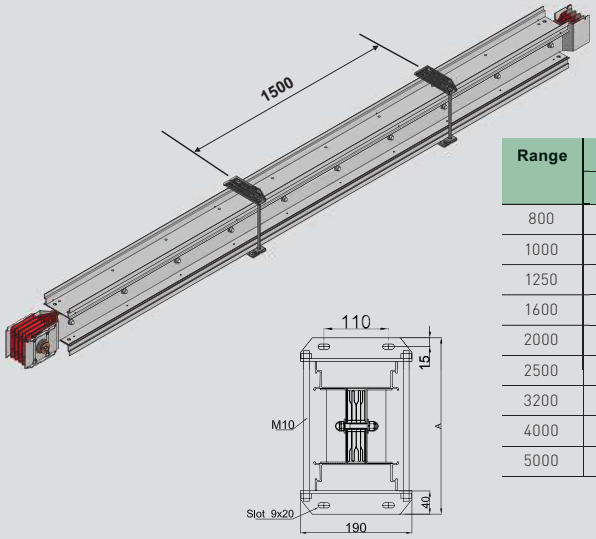
Compact BUSWAYS - HE

brackets

Dimensions

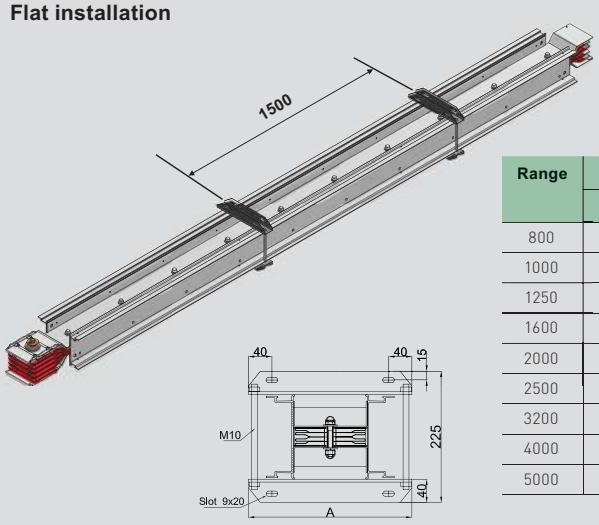
Suspension bracket

Edgewise installation



Range	A (mm)
	Cu
800	300
1000	300
1250	300
1600	300
2000	340
2500	370
3200	470
4000	550
5000	610

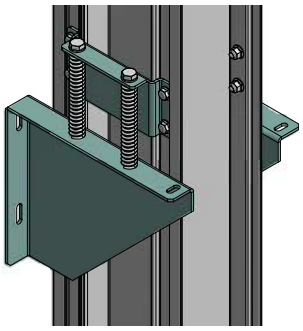
Flat installation



Range	A (mm)
	Cu
800	280
1000	280
1250	280
1600	280
2000	320
2500	350
3200	450
4000	530
5000	590

Compact BUSWAYS - HE

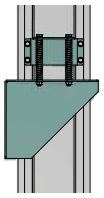
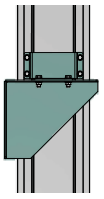
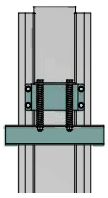
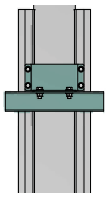
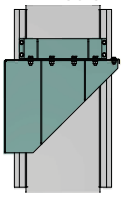
brackets



T65213711

Cat.Nos

Brackets for vertical elements

Cu	In (A)	Type
		Wall bracket and springs
T65213711	800-1250	 A
T65213712	1600	
T65213712	2000	
T65213713	2500	
T65213741	3200	
T65213742	4000	
T65213743	5000	
		Wall bracket
T65213721	800-1250	 B
T65213722	1600	
T65213722	2000	
T65213723	2500	
T65213751	3200	
T65213752	4000	
T65213753	5000	
		Floor Bracket with springs
T65213701	800-1250	 C
T65213702	1600	
T65213702	2000	
T65213703	2500	
T65213731	3200	
T65213732	4000	
T65213733	5000	
		Floor Bracket
T65213761	800-1250	 D
T65213762	1600	
T65213762	2000	
T65213763	2500	
T65213771	3200	
T65213772	4000	
T65213773	5000	
-	800-2000	* Anti-seismic bracket
-	2500	
T65213791	3200	 E
T65213792	4000	
T65213793	5000	

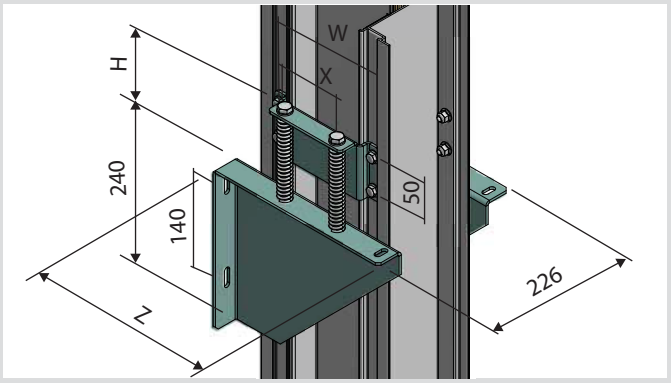
*For more technical details, please contact Bahra TBS

X,Y,Z AND W DIMENSIONS OF THE BRACKETS						
	Type 1 B120 4 SPRINGS	Type 1 B160 4 SPRINGS	Type 2 B190 6 SPRINGS	Type 3 2B120 8 SPRINGS	Type 3 2B160 8 SPRINGS	Type 4 2B190 12 SPRINGS
CBL-HE	800A - 1600A	2000A	2500A	3200A	4000A	5000A
CBL-AE	800-2000A	2500A	-	3200A	4000A-5000A	-
W [mm]	162	202	232	332	4000A	472
Z [mm]	285	350	350	455	590	590
X [mm]	90	130	80	90	110	80
Y [mm]	-	-	-	85	115	80

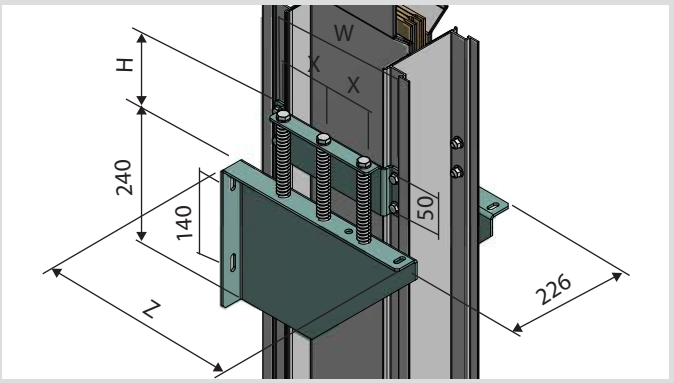
Compact BUSWAYS - HE

brackets

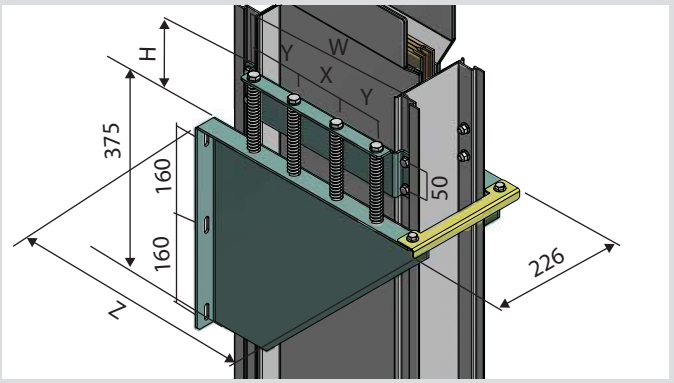
TYPE 1 (B120/B160)



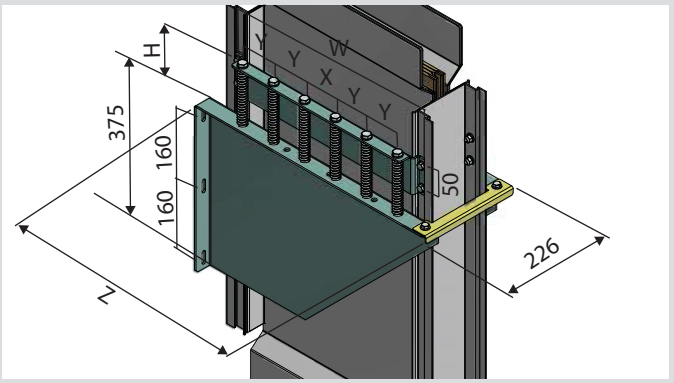
TYPE 2 (B190)



TYPE 3 (2B120/2B160)



TYPE 4 (2B190)



Fixing indication

brackets

Technical information

For vertical path **sections of less than 2 m** the use of standard suspension brackets is sufficient

1- Horizontal installation fixing

Fixing recommended: 1 bracket every 1.5 metres

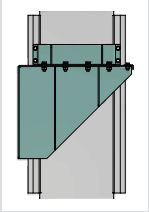
2- Fixing for vertical installation (rising mains)

In case of rising mains, in addition to the standard brackets it will also be necessary to use other screw fixed brackets to prevent sliding of the busbar. Thanks to pre-loaded springs, these brackets absorb the forces pressing on the busbar and direct any expansion in a precise direction They therefore operate as a limitation, and support the traction and compression forces of the busbar trunking system

- **Section line between 2 and 4 m**
  In the lowest point **Type B** vertical bracket if secured **to the wall**, or **Type D** if secured **to the floor** + one edgewise installation **standard bracket**
- **Section line of over 4 m**
  In the lowest point **Type A** vertical bracket if secured **to the wall**, or **Type C** if secured **to the floor** + one edgewise installation **standard bracket** every metre and a half of the path + **one Type A or C** bracket based on the following table

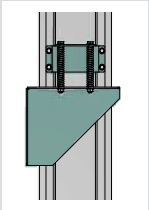
3- Fixing for installation in seismic environments in horizontal

Fit 1 bracket every metre and a half of the busbar
Every 2 anti-seismic brackets with bracket (Type B), use one standard bracket

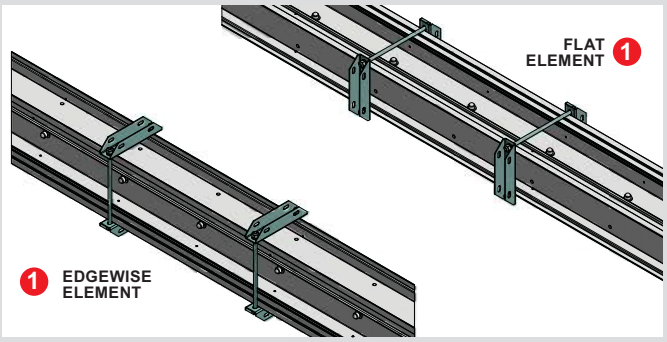


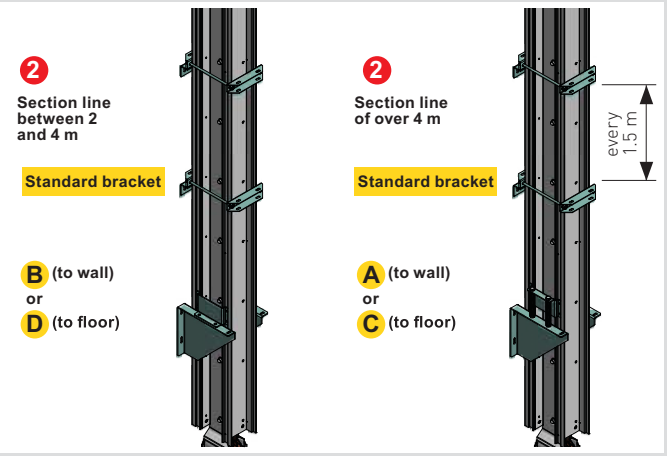
4- Fixing for installation in seismic environments in vertical (section lengths > 2 m)

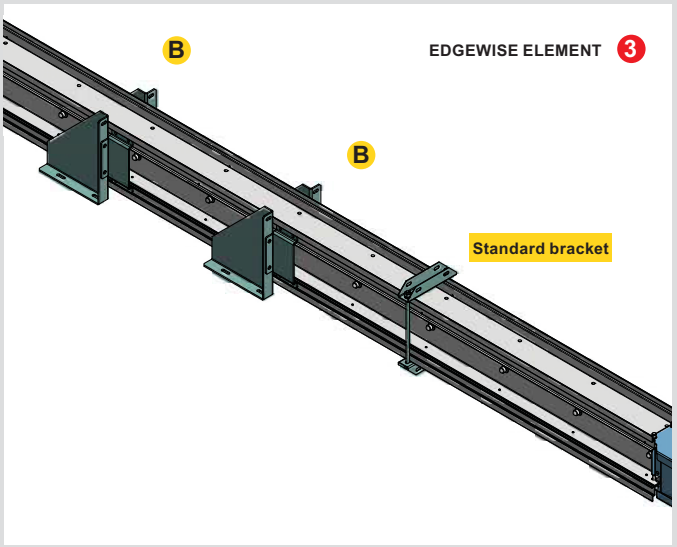
Fit 1 bracket every metre and a half of the busbar
Every 2 anti-seismic brackets with bracket (Type B) use one bracket with bracket and spring (Type A)

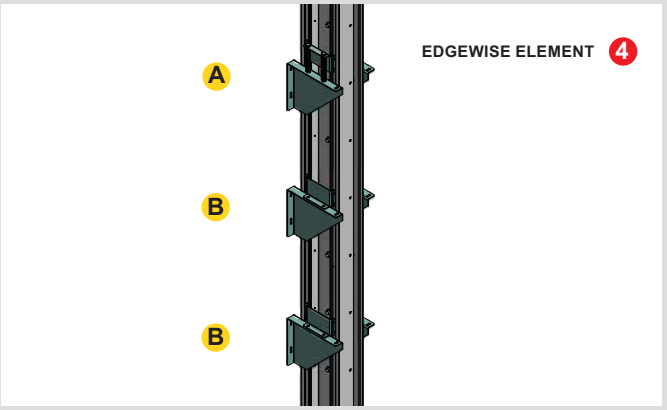


For more installation details, please refer to the installation instructions.









Compact BUSWAYS - HE

operating instructions on how to design riser mains

1) The RH misaligned feed units (without monobloc) are used at the departure of the riser mains lines, allow the busbar to be installed 40 mm away from the wall.
In order to position the tap-off boxes correctly as shown in the figure, the neutral conductor of the riser main must be on the left side of the element

2) The tap-off boxes can be installed in the tap-off outlets (Plug-in type) and on the junction of elements (Bolt-on type)

3) Use elements with tap-off outlets where necessary, distribute the power using plug-in boxes

4) Use EI120 fire bar rier kit for each compartment floor, where specifically requested

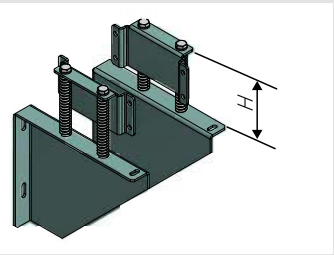
5) At the end of the riser mains, position the IP55 end cover

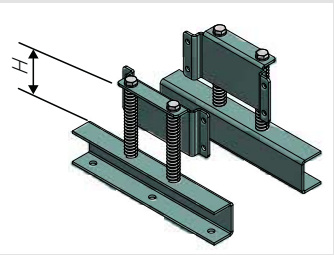
Maximum hanging distance with springs (Dmax):

CBL HE 4C		
In (A)	**D max**	**Kit springs**
800	8	4
1000	8	4
1250	7	4
1600	6	4
2000	5	4
2500	5	6
3200	7	8
4000	6	8
5000	5	12

For 5C version multiply Dmax by 0.85

Spring preload calculation (H):





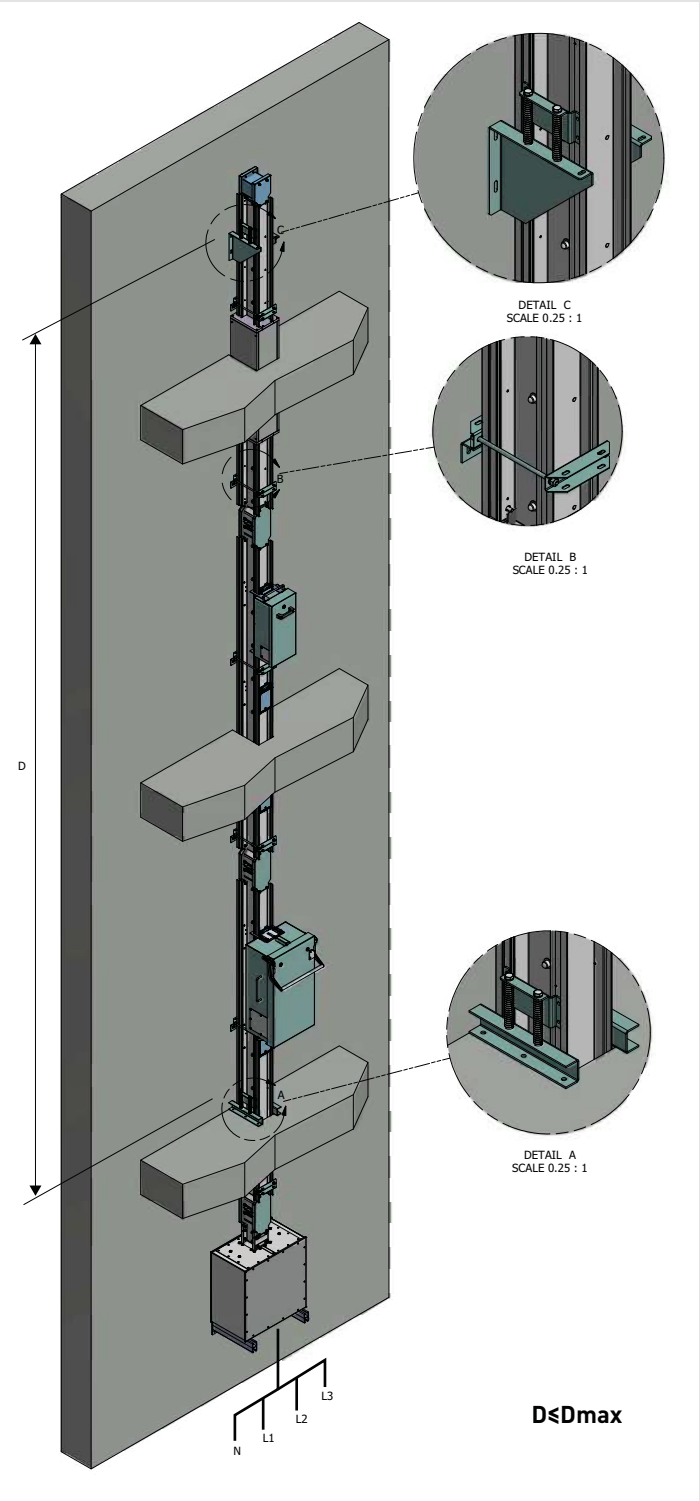
$$W = \frac{\text{Busway } \frac{(Kg)}{m} \times D\ (m) + \text{total weight of devices (kg)}}{\text{Number of springs}}$$

$$H = 130 - \frac{W}{3}$$

Preload calculation example H

Busbar type: 5C (+Pe sheet)
In (A) : 2000
Dmax (m): 5x0.85 = 4.25
D (m): 4
Busbar (Kg/m): 45.3
Weight of box 1 (Kg): 13
Weight of box 2 (Kg): 37

$$H = 130 - \frac{(45.3 \times 4) + 13 + 37}{4 \times 3} = 110 \text{ mm}$$



A) Floor hanger: use one or more of this suspension brackets, according to the weight of the whole riser mains (including the boxes).
For risers that are shorter than 4 meters, fix to the base with type D brackets (see pag. 39), when longer, use a type C suspension brackets (see pag. 39) respecting the maximum distances (Dmax) indicated in the tables.

B) Standard hanger: use this type of suspension bracket to hang the busbar every 1,5 metres of riser mains.

C) Wall hanger: use one or more of this suspension brackets, according to the weight of the whole riser mains (including the boxes).
For risers that are shorter than 4 meters, fix to the base with type B brackets (see pag. 39), when longer, use a type A suspension brackets (see pag. 39) respecting the maximum distances (Dmax) indicated in the tables.

Compact BUSWAYS - HE

operating recommendations on how to design riser mains

1) Use an RH end feed unit (without monobloc)
In order to position the tap-off boxes correctly as shown in the figure, the neutral conductor of the riser main must be on the left side of the element

2) Use one or more suspension brackets for the vertical elements, according to the weight of the whole riser mains.

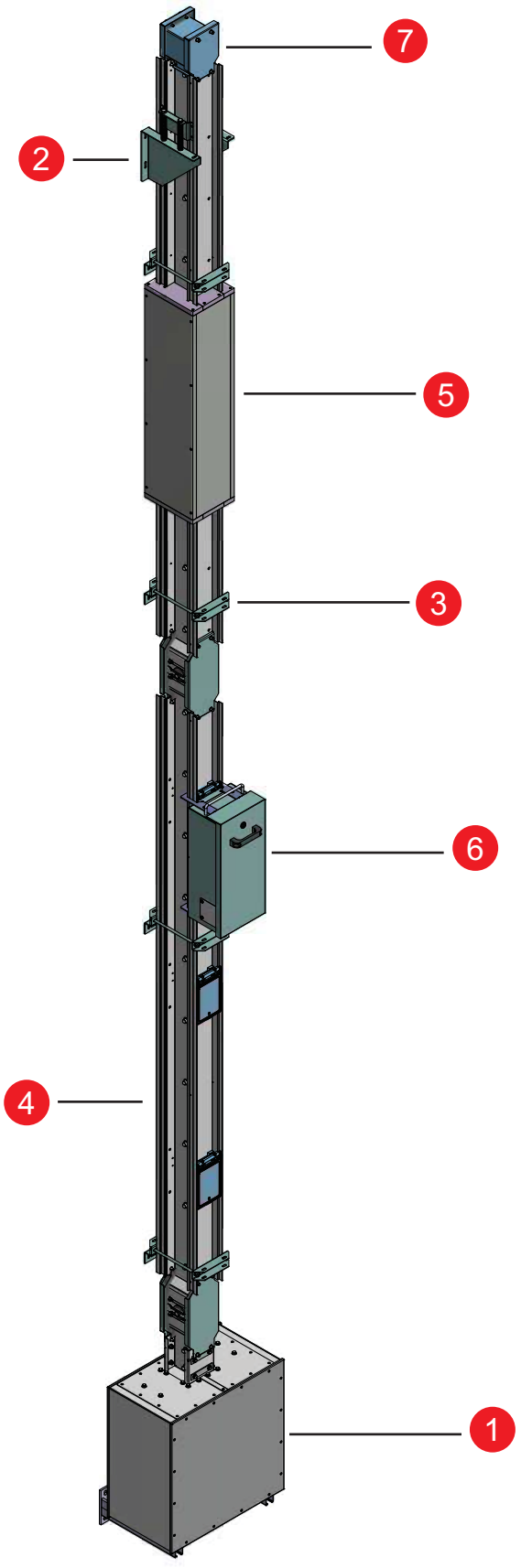
3) Use a standard suspension bracket to hang the busbar every 1.5 metres of riser mains

4) Use elements with tap-off outlets where necessary, distribute the power using plug-in boxes

5) Use S120 fire barrier kit for each compartment floor, where specifically requested

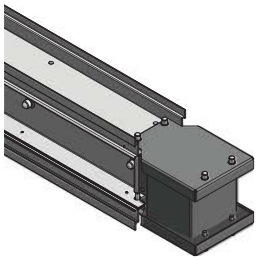
6) The tap-off boxes can be installed in the tap-off outlets and near the connection between the elements

7) At the end of the riser mains, position the IP55 end cover

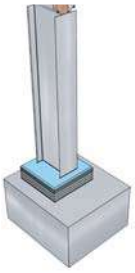


Compact BUSWAYS - HE

accessories



T65283101



TSF766040

Cat.Nos	End cover IP55
Cu	The end cover is the component that ensures an IP55 protection degree at the end of the line
	In (A)
T65283101	800
T65283101	1000
T65283101	1250
T65283102	1600
T65283102	2000
T65283103	2500
T65393101	3200
T65393102	4000
T65393103	5000

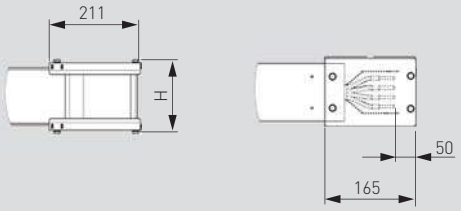
	Protective bellow
Cu	Recommended for protection of the interface connection on electric boards, dry-type transformer with enclosure and oil-type transformers
	In (A)
TSF766040	Single bellow 760x600 mm. H 400
TSF927140	Double bellow 920x710 mm. H 400

Compact BUSWAYS - HE

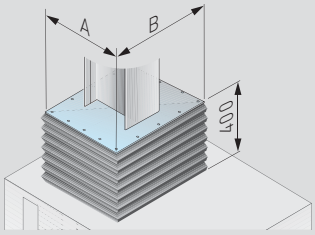
accessories

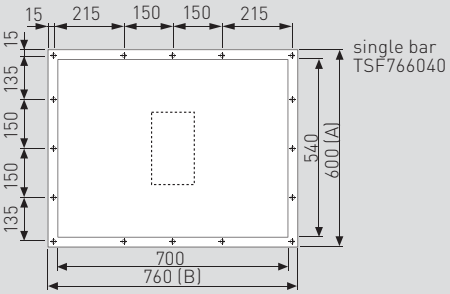
Dimensions

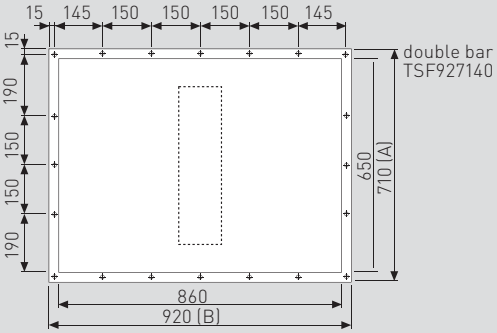
End cover IP55



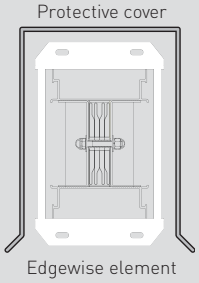
Protective bellow

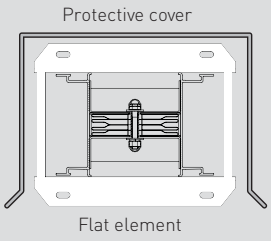






Protective cover for outdoor applications





Covering accessory to be used for outdoor installations and wherever the standard IP55 Degree of protection is not adequate

The protective cover for outdoor applications does not change the degree of protection IP of the busbar duct

Flexible

Flexible braid connections are used to connect the transformer to the connection interface of the busbar when mechanically uncoupling the two elements is required, to prevent the transmission of vibrations

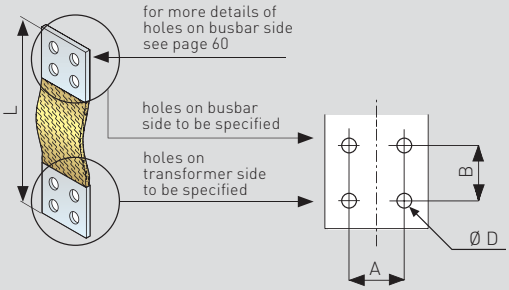
Cat.Nos **Flexible braid connections**

Cu	In (A)	N° braid per phase	L (mm)
TFC100010	800	1	300-450
TFC200010	1000		
TFC300010	1250		
TFC500010	1600		
TFC600010	2000		
TFC400010	2500	2	
TFC500010	3200		
TFC600010	4000		
TFC700010	5000		
TFC100020	800	1	451-600
TFC200020	1000		
TFC300020	1250		
TFC500020	1600		
TFC600020	2000		
TFC400020	2500	2	
TFC500020	3200		
TFC600020	4000		
TFC700020	5000		
TFC100030	800	1	601-750
TFC200030	1000		
TFC300030	1250		
TFC500030	1600		
TFC600030	2000		
TFC400030	2500	2	
TFC500030	3200		
TFC600030	4000		
TFC700030	5000		
TFC100099	800	1	→ 750
TFC200099	1000		
TFC300099	1250		
TFC500099	1600		
TFC600099	2000		
TFC400099	2500	2	
TFC500099	3200		
TFC600099	4000		
TFC700099	5000		

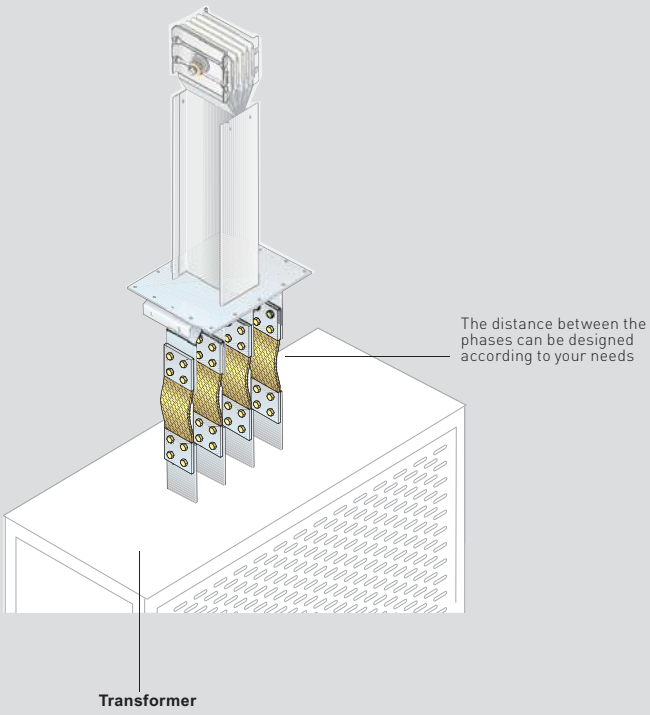
Compact BUSWAYS - HE
flexible braid connections

Dimensions

Flexible



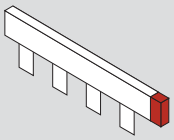
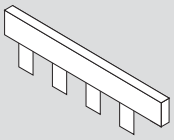
When ordering, specify:
holes on transformer side
(dimensions A, B, Ø D) and length L



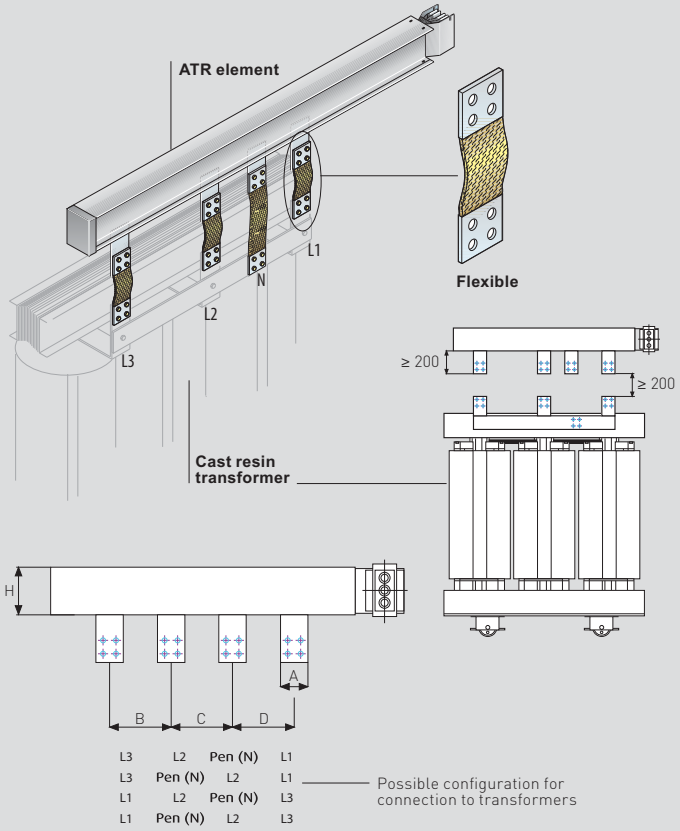
Note: for insulated flexible braid, please contact Bahra TBS.

ATR elements

ATR are elements used for connection to electric boards or transformers, similar in everything to straight elements
These elements may be used for connection to both cast resin and oil transformers, and offer the advantage that the connection interfaces may be installed directly on the vertical section of the transformer terminals, minimising the time required for the connection of the busbar trunking system to the transformer. Each element is designed based on precise connection specifications supplied by the customer

SIMPLE ATR	
 Type 1	 Type 2

Dimensions



ATR dimensions

Although designed ad-hoc, ATR elements are still subjected to construction limits. Below are the summarizing tables indicating these values

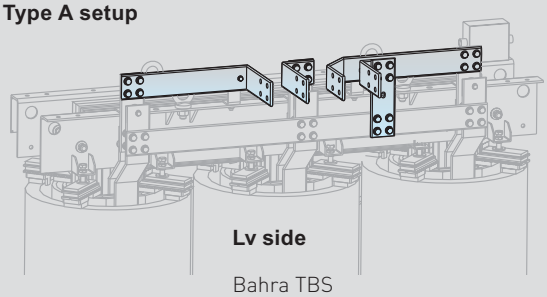
INTERAXES (mm)					
Cu					
In (A)	A	B	C	D	H
800	70	165	165	165	220
1000	70	165	165	165	220
1250	85	165	165	165	220
1600	100	205	205	205	220
2000	120	205	205	205	260
2500	160	255	255	255	290
3200	190	205	205	205	390
4000	120	235	235	235	470
5000	160	255	255	255	530

Compact BUSWAYS - HE

ATR elements

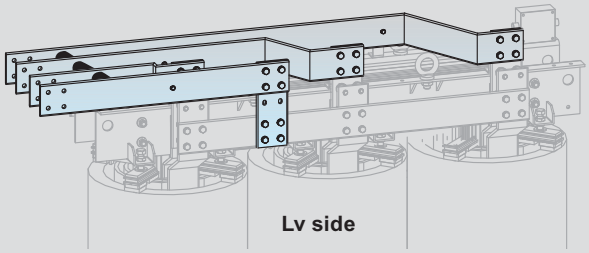
The system: the Bahra TBS transformer advantage

Type A setup



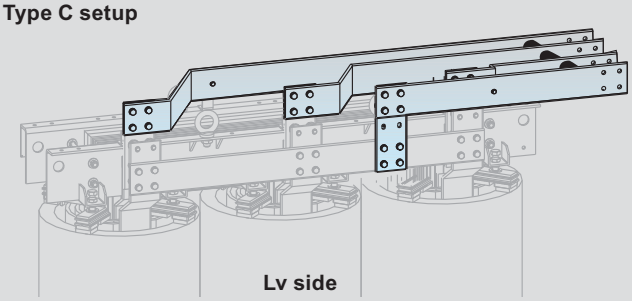
Bahra TBS
Cast Resin Transformers

Type B setup



Bahra TBS
Cast Resin Transformers

Type C setup



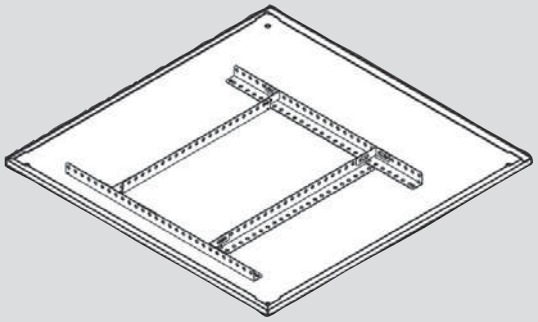
Bahra TBS
Cast Resin Transformers

The Bahra TBS group product synergy answers to the global installation need
The Bahra TBS cast resin transformers have specifically designed connections for the Bahra TBS busbars

The versions shown represent some of the standardized solutions

Please contact Bahra TBS for more details on the dimensions

The system:the Bahra TBS XL³ advantage



Installation kit for XL³ cabinets

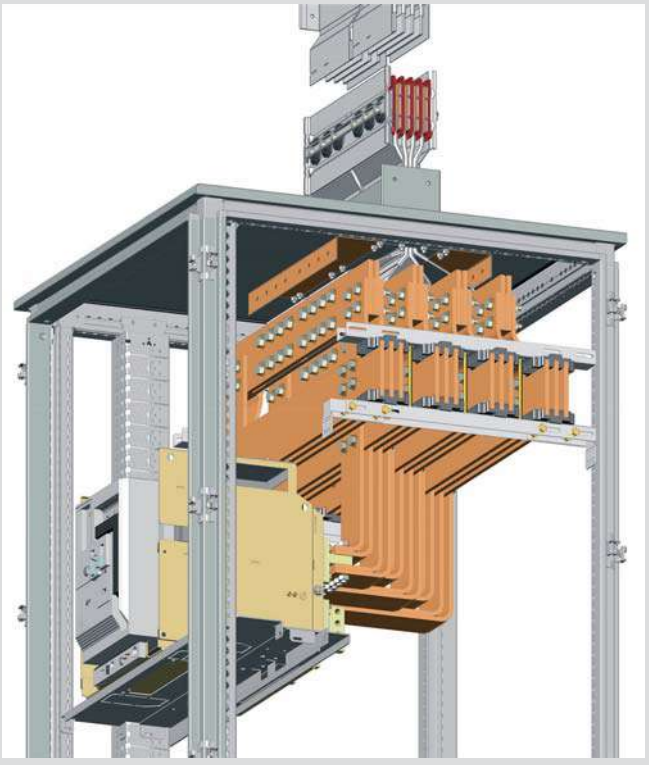
Kit Cat.No 0 205 29 for reinforcing the roof of the XL³ cabinets for the installation of the Bahra TBS interface to connect the busbar systems

The Compact BUSWAYS range can be easily and immediately combined with the Bahra TBS XL³ 4000 cabinets
The reinforcement kit enables you to install any type of unit to the board onto the roof of the XL³ structure in a quick and easy way

Upon request, and with the specific measurements, custom made connections between our BUSWAY interface and the DMX air-circuit breaker can be supplied for installation in the XL³ cabinets

The safety and the operational efficiency of the Bahra TBS system are guaranteed by the system certification, achieved after rigorous tests carried out in the most important international laboratories.

For more details about the XL³, please refer to the general Bahra TBS catalogue



Compact BUSWAYS - HE

technical information

General features

The Compact BUSWAY line is available in the standard range:
From **800A to 6300A with copper conductors**
The dimensions of our BUSWAY enhance **its resistance to short circuit stresses**; in addition, they can reduce the impedance of the circuit by controlling the voltage drops and allow for the installation of high power electrical systems, even in extremely confined spaces.
Our BUSWAY is available with **a wide selection of tap-off boxes that range from 63A up to 1250A**, thus allowing you to locally protect and feed different types of loads by housing protective devices such as fuses, MCCBs and motorised switches
Our BUSWAY is not only in **compliance with** the harmonised **Standards IEC 61439-6** but also answers specifically to many clients needs for more severe conditions of use
Thus **the rated current** of Bahra TBS's busbar trunking systems is **always referred to the average ambient temperature of 35°C** thus providing the markets with suitably **upgraded** products
The nominal range of all our BUSWAYS is guaranteed both for horizontal installations (flat and edgewise) and for vertical installations without downgrading
Our busbar trunking systems are designed so that they can **be maintenance-free**, except for the periodic and compulsory inspections required by the Standard IEC 60364
The tightening torque inspection of the junction can be carried out by qualified personnel, even when the busbar is energized

Structural features

The outer casing of our compact BUSWAYS line consists of four C section aluminum casing & cover riveted, with excellent mechanical, electric and heat loss efficiency. The aluminum casing & cover are treated and painted with RAL7035 with a high resistance to chemical agents. The standard degree of protection is IP55, on request IP65/IP66; also with certain accessories, it can also be installed outdoors. The busbar copper conductors have a rectangular cross section with rounded corners, tin-plated and insulated with epoxy.

The insulation between bars is ensured by epoxy class B (130°C) (Class F (155°C) thermal resistance available on request.

All plastic components have a **V1 self-extinguishing degree** (as per UL94); they are fire retardant and comply with the glow-wire test according to standards.

Our compact BUSWAYS line is **Halogen Free.** In order to facilitate storage operations especially to reduce the installation time, the straight elements, trunking **components** as well as all the components of the BUSWAY line are **supplied with a monobloc pre-installed at the factory.**

The junction contact is ensured by **tin plated copper for each phase**, insulated with red **class F thermosetting plastic material**
The **monobloc** has **shearhead nuts**: after tightening the nuts with a standard wrench, the outer head will break at the correct torque value, hence giving you the certainty that the connection has been made properly so as to guarantee safety and maximum performance over time.

Finally, in order to completely verify the insulation level, every element with a monobloc undergoes an **insulation test** (phase-phase, phase-PE) at the factory with a test voltage of 3500 V AC for 1.5 seconds.

CBL-HE Busway										
Temperature	15	20	25	30	35	40	45	**50**	55	60
Kt Factor	1.12	1.18	1.15	1.12	1.08	1.05	1.03	**1.00**	0.975	0.95

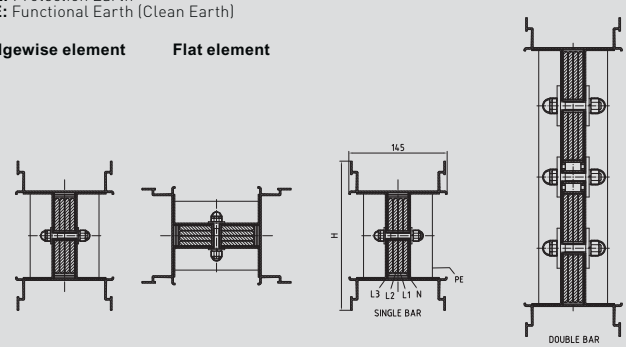
RATED CURRENT OF Bahra TBS BUSBARS (A)									
Cu	800	1000	1250	1600	2000	2500	3200	4000	5000
	Single bar						Double bar		

Standard versions:

Bahra TBS BUSWAY Standard rating line with 4 conductors 3P+N+PE, 3P+PEN, 3P+FE+PE

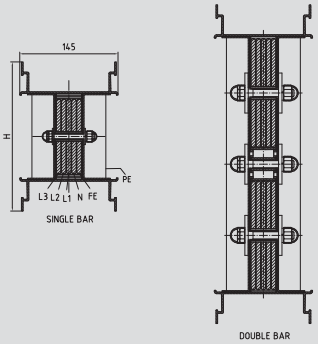
Note: For dimension H, see technical data section
PE: Protection Earth
FE: Functional Earth (Clean Earth)

Edgewise element **Flat element**



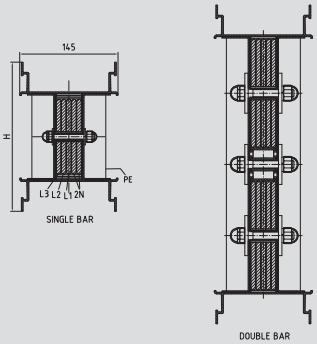
Bahra TBS BUSWAY Standard rating line with 5 conductors 3P+N+FE+PE

Note: For dimension H, see technical data section
PE: Protection Earth
FE: Functional Earth (Clean Earth)



Bahra TBS BUSWAY Standard rating with 2N 200% Neutral line 3P+2N+PE

Note: For dimension H, see technical data section
PE: Protection Earth
2N: 200% Neutral



Special versions on request

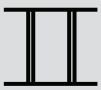
Compact BUSWAYS - HE

technical data

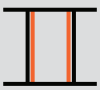
Bahra TBS Compact Busway Rating - 4 Conductors

			SINGLE BAR						DOUBLE BAR		
Rated current	In [A]		800	1000	1250	1600	2000	2500	3200	4000	5000
Overall dimension of the busbars	L x H [mm]		145x220	145x220	145x220	145x220	145x260	145x290	145x390	145x470	145x530
Rated operational voltage	Ue [V]		1000	1000	1000	1000	1000	1000	1000	1000	1000
Rated insulation voltage	Ui [V]		1000	1000	1000	1000	1000	1000	1000	1000	1000
Frequency	f [Hz]		50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60
Rated short-time current (1 s)	ICW [kA]rms		50	50	60	60	88	88	150	150	150
Peak current	Ipk [kA]		105	105	132	132	194	194	330	330	330
Rated short-time current of the neutral bar (1 s)	ICW [kA]rms		30	30	36	36	53	53	90	90	90
Peak current of the neutral bar	Ipk [kA]		63	63	76	76	116	116	198	198	198
Rated short-time current of the protective circuit (1 s)	ICW [kA]rms		30	30	36	36	53	53	90	90	90
Peak current of the protective circuit	Ipk [kA]		63	63	76	76	116	116	198	198	198
Average phase resistance at 20°C	R20 [mΩ/m]		0.044	0.043	0.034	0.027	0.020	0.016	0.012	0.010	0.008
Average phase reactance	X [mΩ/m]		0.018	0.018	0.016	0.016	0.011	0.009	0.007	0.006	0.005
Average phase impedance	Z [mΩ/m]		0.048	0.046	0.038	0.032	0.022	0.018	0.014	0.011	0.009
Average phase resistance at thermal conditions	R [mΩ/m]		0.051	0.052	0.042	0.034	0.025	0.021	0.016	0.013	0.011
Average phase impedance at thermal conditions	Z [mΩ/m]		0.054	0.055	0.045	0.038	0.027	0.023	0.018	0.014	0.012
Average Neutral resistance	R20 [mΩ/m]		0.044	0.043	0.034	0.027	0.020	0.016	0.012	0.010	0.008
Average Resistance of the protective bar (STD)	RPE [mΩ/m]		0.020	0.020	0.020	0.020	0.019	0.018	0.015	0.014	0.013
Average Resistance of the protective bar (+ PE Sheet)	RPE [mΩ/m]		0.043	0.043	0.043	0.043	0.033	0.028	0.022	0.016	0.014
Average reactance of the protective bar	XPE [mΩ/m]		0.054	0.054	0.054	0.054	0.044	0.032	0.022	0.017	0.016
Average resistance of the fault loop (STD)	Ro [mΩ/m]		0.064	0.063	0.055	0.048	0.038	0.034	0.028	0.024	0.021
Average resistance of the fault loop (+ PE Sheet)	Ro [mΩ/m]		0.087	0.086	0.078	0.071	0.052	0.044	0.034	0.026	0.022
Average reactance of the fault loop	Xo [mΩ/m]		0.07	0.07	0.07	0.07	0.06	0.04	0.03	0.02	0.02
Average impedance of the fault loop (STD)	Zo [mΩ/m]		0.097	0.096	0.089	0.085	0.067	0.053	0.040	0.033	0.030
Average impedance of the fault loop (+ PE Sheet)	Zo [mΩ/m]		0.113	0.112	0.105	0.100	0.076	0.060	0.045	0.035	0.030
Zero-sequence short-circuit average resistance phase - N	Ro [mΩ/m]		0.059	0.057	0.046	0.037	0.026	0.021	0.017	0.013	0.011
Zero-sequence short-circuit average reactance phase - N	Xo [mΩ/m]		0.024	0.024	0.021	0.021	0.015	0.012	0.009	0.008	0.007
Zero-sequence short-circuit average impedance phase - N	Zo [mΩ/m]		0.063	0.062	0.051	0.042	0.030	0.025	0.019	0.015	0.013
Zero-sequence short-circuit average resistance phase - PE	Ro [mΩ/m]		0.079	0.077	0.066	0.057	0.045	0.039	0.032	0.027	0.024
Zero-sequence short-circuit average reactance phase - PE	Xo [mΩ/m]		0.060	0.060	0.059	0.059	0.048	0.035	0.024	0.019	0.018
Zero-sequence short-circuit average impedance phase - PE	Zo [mΩ/m]		0.099	0.098	0.089	0.082	0.066	0.053	0.040	0.033	0.029
Voltage drop with distribuited load ΔV [V/(m*A)]10⁻⁶	cosø =	0.70	42.1	42.6	35.5	30.7	21.8	18.1	14.2	11.6	9.7
	cosø =	0.75	43.5	44.0	36.6	31.4	22.3	18.6	14.5	11.9	9.9
	cosø =	0.80	44.7	45.3	37.6	32.1	22.8	19.1	14.9	12.1	10.1
	cosø =	0.85	45.8	46.4	38.4	32.5	23.2	19.4	15.1	12.3	10.3
	cosø =	0.90	46.6	47.3	39.0	32.7	23.4	19.6	15.3	12.4	10.4
	cosø =	0.95	46.9	47.6	39.1	32.5	23.3	19.5	15.2	12.3	10.3
	cosø =	1.00	44.2	45.0	36.6	29.7	21.4	18.0	14.0	11.2	9.4
Weight (STD)	p [kg/m]		23.7	24.1	27.7	32.1	43.7	51.8	68.6	85.9	101.8
Weight (+ PE Sheet)	p [kg/m]		27.3	27.7	31.3	35.8	48.5	57.4	75.8	95.2	113.0
Fire load	[kWh/m]		4.5	5.5	5.5	8.0	8.2	10.5	16.0	19.0	21.0
Degree of protection	IP		55	55	55	55	55	55	55	55	55
Insulation material thermal resistance class			B/F*	B/F*	B/F*	B/F*	B/F*	B/F*	B/F*	B/F*	B/F*
Losses for the Joule effect at nominal current	P [W/m]		98	156	198	263	296	389	498	623	817
Ambient temperature min/MAX	[°C]		-5/50	-5/50	-5/50	-5/50	-5/50	-5/50	-5/50	-5/50	-5/50

*** Class F thermal resistance (155°C) available on request**
In: rated current referred to a room temperature of 50°C



STD
Standard version



+ PE Sheet
Extra earth - COPPER
Cu 3L+N+50%PE
(tinned copper conductors)

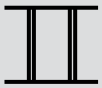
Compact BUSWAYS - HE

technical data (continued)

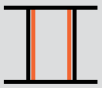
Bahra TBS Compact Busway Rating - 4.5 Conductors

			SINGLE BAR						DOUBLE BAR		
Rated current	In [A]		800	1000	1250	1600	2000	2500	3200	4000	5000
Overall dimension of the busbars	L x H [mm]		145x220	145x220	145x220	145x220	145x260	145x290	145x390	145x470	145x530
Rated operational voltage	Ue [V]		1000	1000	1000	1000	1000	1000	1000	1000	1000
Rated insulation voltage	Ui [V]		1000	1000	1000	1000	1000	1000	1000	1000	1000
Frequency	f [Hz]		50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60
Rated short-time current (1 s)	ICW [kA]rms		50	50	60	60	88	88	150	150	150
Peak current	Ipk [kA]		105	105	132	132	194	194	330	330	330
Rated short-time current of the neutral bar (1 s)	ICW [kA]rms		30	30	36	36	53	53	90	90	90
Peak current of the neutral bar	Ipk [kA]		63	63	76	76	116	116	198	198	198
Rated short-time current of the protective circuit (1 s)	ICW [kA]rms		30	30	36	36	53	53	90	90	90
Peak current of the protective circuit	Ipk [kA]		63	63	76	76	116	116	198	198	198
Average phase resistance at 20°C	R20 [mΩ/m]		0.044	0.043	0.034	0.027	0.020	0.016	0.012	0.010	0.008
Average phase reactance	X [mΩ/m]		0.018	0.018	0.016	0.016	0.011	0.009	0.007	0.006	0.005
Average phase impedance	Z [mΩ/m]		0.048	0.046	0.038	0.032	0.022	0.018	0.014	0.011	0.009
Average phase resistance at thermal conditions	R [mΩ/m]		0.051	0.052	0.042	0.034	0.025	0.021	0.016	0.013	0.011
Average phase impedance at thermal conditions	Z [mΩ/m]		0.054	0.055	0.045	0.038	0.027	0.023	0.018	0.014	0.012
Average Neutral resistance	R20 [mΩ/m]		0.044	0.043	0.034	0.027	0.020	0.016	0.012	0.010	0.008
Average functional Earth resistance (FE)	R20 [mΩ/m]		0.084	0.084	0.069	0.055	0.039	0.032	0.025	0.019	0.016
Average functional Earth reactance (FE)	X [mΩ/m]		0.022	0.022	0.021	0.020	0.019	0.016	0.014	0.011	0.009
Average Resistance of the protective bar (STD)	RPE [mΩ/m]		0.020	0.020	0.020	0.020	0.019	0.018	0.015	0.014	0.013
Average Resistance of the protective bar (+ PE Sheet)	RPE [mΩ/m]		0.043	0.043	0.043	0.043	0.033	0.028	0.022	0.016	0.014
Average reactance of the protective bar	XPE [mΩ/m]		0.054	0.054	0.054	0.054	0.044	0.032	0.022	0.017	0.016
Average resistance of the fault loop (STD)	Ro [mΩ/m]		0.060	0.059	0.050	0.042	0.032	0.028	0.022	0.018	0.015
Average resistance of the fault loop (+ PE Sheet)	Ro [mΩ/m]		0.073	0.071	0.061	0.052	0.037	0.031	0.024	0.019	0.015
Average reactance of the fault loop	Xo [mΩ/m]		0.07	0.07	0.07	0.07	0.06	0.04	0.03	0.02	0.02
Average impedance of the fault loop (STD)	Zo [mΩ/m]		0.094	0.093	0.086	0.082	0.064	0.049	0.036	0.029	0.026
Average impedance of the fault loop (+ PE Sheet)	Zo [mΩ/m]		0.102	0.101	0.093	0.087	0.066	0.051	0.038	0.030	0.026
Zero-sequence short-circuit average resistance phase - N	Ro [mΩ/m]		0.059	0.057	0.046	0.037	0.026	0.021	0.017	0.013	0.011
Zero-sequence short-circuit average reactance phase - N	Xo [mΩ/m]		0.024	0.024	0.021	0.021	0.015	0.012	0.009	0.008	0.007
Zero-sequence short-circuit average impedance phase - N	Zo [mΩ/m]		0.063	0.062	0.051	0.042	0.030	0.025	0.019	0.015	0.013
Zero-sequence short-circuit average resistance phase - PE	Ro [mΩ/m]		0.059	0.057	0.046	0.037	0.026	0.021	0.017	0.013	0.011
Zero-sequence short-circuit average reactance phase - PE	Xo [mΩ/m]		0.024	0.024	0.021	0.021	0.015	0.012	0.009	0.008	0.007
Zero-sequence short-circuit average impedance phase - PE	Zo [mΩ/m]		0.063	0.062	0.051	0.042	0.030	0.025	0.019	0.015	0.013
Voltage drop with distribuited load ΔV [V/(m*A)]10⁻⁶	cosø =	0.70	42.1	42.6	35.5	30.7	21.8	18.1	14.2	11.6	9.7
	cosø =	0.75	43.5	44.0	36.6	31.4	22.3	18.6	14.5	11.9	9.9
	cosø =	0.80	44.7	45.3	37.6	32.1	22.8	19.1	14.9	12.1	10.1
	cosø =	0.85	45.8	46.4	38.4	32.5	23.2	19.4	15.1	12.3	10.3
	cosø =	0.90	46.6	47.3	39.0	32.7	23.4	19.6	15.3	12.4	10.4
	cosø =	0.95	46.9	47.6	39.1	32.5	23.3	19.5	15.2	12.3	10.3
	cosø =	1.00	44.2	45.0	36.6	29.7	21.4	18.0	14.0	11.2	9.4
Weight (STD)	p [kg/m]		26.3	26.8	30.8	35.9	48.9	58.0	76.8	96.2	114.4
Weight (+ PE Sheet)	p [kg/m]		29.9	30.4	34.4	39.5	53.7	63.7	84.1	105.8	125.7
Fire load	[kWh/m]		5.6	6.9	6.9	10.0	10.3	13.1	20.0	23.8	26.3
Degree of protection	IP		55	55	55	55	55	55	55	55	55
Insulation material thermal resistance class			B/F*	B/F*	B/F*	B/F*	B/F*	B/F*	B/F*	B/F*	B/F*
Losses for the Joule effect at nominal current	P [W/m]		98	156	198	263	296	389	498	623	817
Ambient temperature min/MAX	[°C]		-5/50	-5/50	-5/50	-5/50	-5/50	-5/50	-5/50	-5/50	-5/50

*** Class F thermal resistance (155°C) available on request**
In: rated current referred to a room temperature of 50°C



STD
Standard version



+ PE Sheet
Extra earth - COPPER
Cu 3L+N+50%PE
(tinned copper conductors)

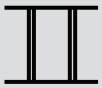
Compact BUSWAYS - HE

technical data

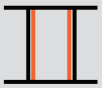
Bahra TBS Compact Busway Rating - 5 Conductors

			SINGLE BAR						DOUBLE BAR		
Rated current	In [A]		800	1000	1250	1600	2000	2500	3200	4000	5000
Overall dimension of the busbars	L x H [mm]		145x220	145x220	145x220	145x220	145x260	145x290	145x390	145x470	145x530
Rated operational voltage	Ue [V]		1000	1000	1000	1000	1000	1000	1000	1000	1000
Rated insulation voltage	Ui [V]		1000	1000	1000	1000	1000	1000	1000	1000	1000
Frequency	f [Hz]		50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60
Rated short-time current (1 s)	ICW [kA]rms		50	50	60	60	88	88	150	150	150
Peak current	Ipk [kA]		105	105	132	132	194	194	330	330	330
Rated short-time current of the neutral bar (1 s)	ICW [kA]rms		30	30	36	36	53	53	90	90	90
Peak current of the neutral bar	Ipk [kA]		63	63	76	76	116	116	198	198	198
Rated short-time current of the protective circuit (1 s)	ICW [kA]rms		30	30	36	36	53	53	90	90	90
Peak current of the protective circuit	Ipk [kA]		63	63	76	76	116	116	198	198	198
Average phase resistance at 20°C	R20 [mΩ/m]		0.044	0.043	0.034	0.027	0.020	0.016	0.012	0.010	0.008
Average phase reactance	X [mΩ/m]		0.018	0.018	0.016	0.016	0.011	0.009	0.007	0.006	0.005
Average phase impedance	Z [mΩ/m]		0.048	0.046	0.038	0.032	0.022	0.018	0.014	0.011	0.009
Average phase resistance at thermal conditions	R [mΩ/m]		0.051	0.052	0.042	0.034	0.025	0.021	0.016	0.013	0.011
Average phase impedance at thermal conditions	Z [mΩ/m]		0.054	0.055	0.045	0.038	0.027	0.023	0.018	0.014	0.012
Average Neutral resistance	R20 [mΩ/m]		0.044	0.043	0.034	0.027	0.020	0.016	0.012	0.010	0.008
Average functional Earth resistance (FE)	R20 [mΩ/m]		0.044	0.043	0.034	0.027	0.020	0.016	0.012	0.010	0.008
Average functional Earth reactance (FE)	X [mΩ/m]		0.018	0.018	0.016	0.016	0.011	0.009	0.007	0.006	0.005
Average Resistance of the protective bar (STD)	RPE [mΩ/m]		0.020	0.020	0.020	0.020	0.019	0.018	0.015	0.014	0.013
Average Resistance of the protective bar (+ PE Sheet)	RPE [mΩ/m]		0.043	0.043	0.043	0.043	0.033	0.028	0.022	0.016	0.014
Average reactance of the protective bar	XPE [mΩ/m]		0.054	0.054	0.054	0.054	0.044	0.032	0.022	0.017	0.016
Average resistance of the fault loop (STD)	Ro [mΩ/m]		0.058	0.056	0.047	0.039	0.029	0.025	0.019	0.015	0.013
Average resistance of the fault loop (+ PE Sheet)	Ro [mΩ/m]		0.066	0.064	0.054	0.044	0.032	0.026	0.020	0.016	0.013
Average reactance of the fault loop	Xo [mΩ/m]		0.07	0.07	0.07	0.07	0.06	0.04	0.03	0.02	0.02
Average impedance of the fault loop (STD)	Zo [mΩ/m]		0.092	0.092	0.084	0.080	0.062	0.048	0.035	0.028	0.025
Average impedance of the fault loop (+ PE Sheet)	Zo [mΩ/m]		0.098	0.096	0.088	0.083	0.064	0.049	0.035	0.028	0.025
Zero-sequence short-circuit average resistance phase - N	Ro [mΩ/m]		0.059	0.057	0.046	0.037	0.026	0.021	0.017	0.013	0.011
Zero-sequence short-circuit average reactance phase - N	Xo [mΩ/m]		0.024	0.024	0.021	0.021	0.015	0.012	0.009	0.008	0.007
Zero-sequence short-circuit average impedance phase - N	Zo [mΩ/m]		0.063	0.062	0.051	0.042	0.030	0.025	0.019	0.015	0.013
Zero-sequence short-circuit average resistance phase - PE	Ro [mΩ/m]		0.059	0.057	0.046	0.037	0.026	0.021	0.017	0.013	0.011
Zero-sequence short-circuit average reactance phase - PE	Xo [mΩ/m]		0.024	0.024	0.021	0.021	0.015	0.012	0.009	0.008	0.007
Zero-sequence short-circuit average impedance phase - PE	Zo [mΩ/m]		0.063	0.062	0.051	0.042	0.030	0.025	0.019	0.015	0.013
Voltage drop with distribuited load ΔV [V/(m*A)]10⁻⁶	cosø =	0.70	42.1	42.6	35.5	30.7	21.8	18.1	14.2	11.6	9.7
	cosø =	0.75	43.5	44.0	36.6	31.4	22.3	18.6	14.5	11.9	9.9
	cosø =	0.80	44.7	45.3	37.6	32.1	22.8	19.1	14.9	12.1	10.1
	cosø =	0.85	45.8	46.4	38.4	32.5	23.2	19.4	15.1	12.3	10.3
	cosø =	0.90	46.6	47.3	39.0	32.7	23.4	19.6	15.3	12.4	10.4
	cosø =	0.95	46.9	47.6	39.1	32.5	23.3	19.5	15.2	12.3	10.3
	cosø =	1.00	44.2	45.0	36.6	29.7	21.4	18.0	14.0	11.2	9.4
Weight (STD)	p [kg/m]		28.1	28.6	33.1	38.7	52.6	62.9	83.1	104.2	124.1
Weight (+ PE Sheet)	p [kg/m]		31.8	32.3	36.7	42.4	57.7	68.5	90.4	113.8	135.4
Fire load	[kWh/m]		5.6	6.9	6.9	10.0	10.3	13.1	20.0	23.8	26.3
Degree of protection	IP		55	55	55	55	55	55	55	55	55
Insulation material thermal resistance class			B/F*	B/F*	B/F*	B/F*	B/F*	B/F*	B/F*	B/F*	B/F*
Losses for the Joule effect at nominal current	P [W/m]		98	156	198	263	296	389	498	623	817
Ambient temperature min/MAX	[°C]		-5/50	-5/50	-5/50	-5/50	-5/50	-5/50	-5/50	-5/50	-5/50

*** Class F thermal resistance (155°C) available on request**
In: rated current referred to a room temperature of 50°C



STD
Standard version



+ PE Sheet
Extra earth - COPPER
Cu 3L+N+50%PE
(tinned copper conductors)

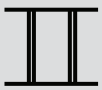
COMPACT BUSWAYS - HE

technical data

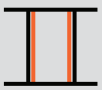
Bahra TBS Compact Busway Rating - Double Neutral(2N)

			SINGLE BAR						DOUBLE BAR		
Rated current	In [A]		800	1000	1250	1600	2000	2500	3200	4000	5000
Overall dimension of the busbars	L x H [mm]		145x220	145x220	145x220	145x220	145x260	145x290	145x390	145x470	145x530
Rated operational voltage	Ue [V]		1000	1000	1000	1000	1000	1000	1000	1000	1000
Rated insulation voltage	Ui [V]		1000	1000	1000	1000	1000	1000	1000	1000	1000
Frequency	f [Hz]		50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60
Rated short-time current (1 s)	ICW [kA]rms		50	50	60	60	88	88	150	150	150
Peak current	Ipk [kA]		105	105	132	132	194	194	330	330	330
Rated short-time current of the neutral bar (1 s)	ICW [kA]rms		30	30	36	36	53	53	90	90	90
Peak current of the neutral bar	Ipk [kA]		63	63	76	76	116	116	198	198	198
Rated short-time current of the protective circuit (1 s)	ICW [kA]rms		30	30	36	36	53	53	90	90	90
Peak current of the protective circuit	Ipk [kA]		63	63	76	76	116	116	198	198	198
Average phase resistance at 20°C	R20 [mΩ/m]		0.044	0.043	0.034	0.027	0.020	0.016	0.012	0.010	0.008
Average phase reactance	X [mΩ/m]		0.018	0.018	0.016	0.016	0.011	0.009	0.007	0.006	0.005
Average phase impedance	Z [mΩ/m]		0.048	0.046	0.038	0.032	0.022	0.018	0.014	0.011	0.009
Average phase resistance at thermal conditions	R [mΩ/m]		0.051	0.052	0.042	0.034	0.025	0.021	0.016	0.013	0.011
Average phase impedance at thermal conditions	Z [mΩ/m]		0.054	0.055	0.045	0.038	0.027	0.023	0.018	0.014	0.012
Average Neutral resistance	R20 [mΩ/m]		0.022	0.021	0.017	0.014	0.010	0.008	0.006	0.005	0.004
Average Resistance of the protective bar (STD)	RPE [mΩ/m]		0.020	0.020	0.020	0.020	0.019	0.018	0.015	0.014	0.013
Average Resistance of the protective bar (+ PE Sheet)	RPE [mΩ/m]		0.043	0.043	0.043	0.043	0.033	0.028	0.022	0.016	0.014
Average reactance of the protective bar	XPE [mΩ/m]		0.054	0.054	0.054	0.054	0.044	0.032	0.022	0.017	0.016
Average resistance of the fault loop (STD)	Ro [mΩ/m]		0.064	0.063	0.055	0.048	0.038	0.034	0.028	0.024	0.021
Average resistance of the fault loop (+ PE Sheet)	Ro [mΩ/m]		0.087	0.086	0.078	0.071	0.052	0.044	0.034	0.026	0.022
Average reactance of the fault loop	Xo [mΩ/m]		0.07	0.07	0.07	0.07	0.06	0.04	0.03	0.02	0.02
Average impedance of the fault loop (STD)	Zo [mΩ/m]		0.097	0.096	0.089	0.085	0.067	0.053	0.040	0.033	0.030
Average impedance of the fault loop (+ PE Sheet)	Zo [mΩ/m]		0.113	0.112	0.105	0.100	0.076	0.060	0.045	0.035	0.030
Zero-sequence short-circuit average resistance phase - N	Ro [mΩ/m]		0.037	0.036	0.029	0.023	0.016	0.013	0.010	0.008	0.007
Zero-sequence short-circuit average reactance phase - N	Xo [mΩ/m]		0.015	0.015	0.013	0.013	0.009	0.008	0.006	0.005	0.004
Zero-sequence short-circuit average impedance phase - N	Zo [mΩ/m]		0.040	0.039	0.032	0.026	0.019	0.015	0.012	0.010	0.008
Zero-sequence short-circuit average resistance phase - PE	Ro [mΩ/m]		0.079	0.077	0.066	0.057	0.045	0.039	0.032	0.027	0.024
Zero-sequence short-circuit average reactance phase - PE	Xo [mΩ/m]		0.060	0.060	0.059	0.059	0.048	0.035	0.024	0.019	0.018
Zero-sequence short-circuit average impedance phase - PE	Zo [mΩ/m]		0.099	0.098	0.089	0.082	0.066	0.053	0.040	0.033	0.029
Voltage drop with distribuited load ΔV [V/(m*A)]10⁻⁶	cosø =	0.70	42.1	42.6	35.5	30.7	21.8	18.1	14.2	11.6	9.7
	cosø =	0.75	43.5	44.0	36.6	31.4	22.3	18.6	14.5	11.9	9.9
	cosø =	0.80	44.7	45.3	37.6	32.1	22.8	19.1	14.9	12.1	10.1
	cosø =	0.85	45.8	46.4	38.4	32.5	23.2	19.4	15.1	12.3	10.3
	cosø =	0.90	46.6	47.3	39.0	32.7	23.4	19.6	15.3	12.4	10.4
	cosø =	0.95	46.9	47.6	39.1	32.5	23.3	19.5	15.2	12.3	10.3
	cosø =	1.00	44.2	45.0	36.6	29.7	21.4	18.0	14.0	11.2	9.4
Weight (STD)	p [kg/m]		28.1	28.6	33.1	38.7	52.6	62.9	83.1	104.2	124.1
Weight (+ PE Sheet)	p [kg/m]		31.8	32.3	36.7	42.4	57.7	68.5	90.4	113.8	135.4
Fire load	[kWh/m]		5.6	6.9	6.9	10.0	10.3	13.1	20.0	23.8	26.3
Degree of protection	IP		55	55	55	55	55	55	55	55	55
Insulation material thermal resistance class			B/F*	B/F*	B/F*	B/F*	B/F*	B/F*	B/F*	B/F*	B/F*
Losses for the Joule effect at nominal current	P [W/m]		98	156	198	263	296	389	498	623	817
Ambient temperature min/MAX	[°C]		-5/50	-5/50	-5/50	-5/50	-5/50	-5/50	-5/50	-5/50	-5/50

*** Class F thermal resistance (155°C) available on request**
In: rated current referred to a room temperature of 50°C



STD
Standard version

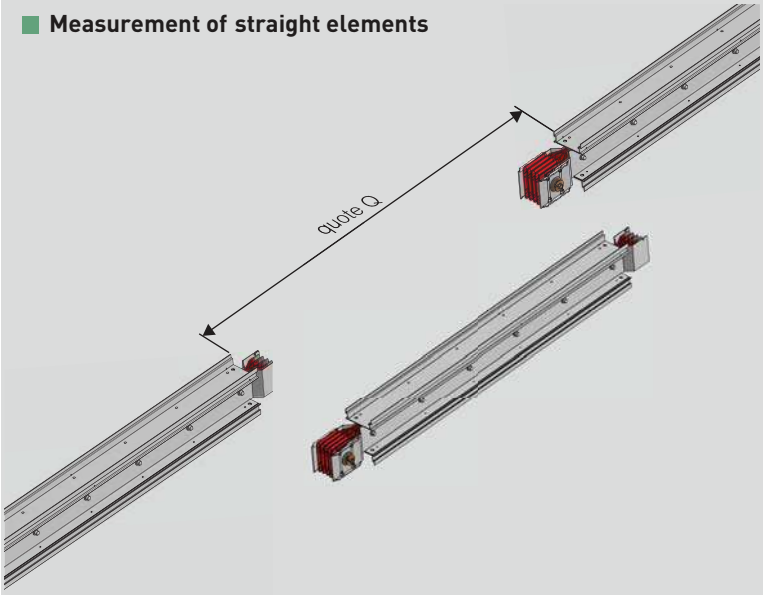


+ PE Sheet
Extra earth - COPPER
Cu 3L+N+50%PE
(tinned copper conductors)

Compact BUSWAYS - HE

measurement of special element lengths

Measurement of straight elements

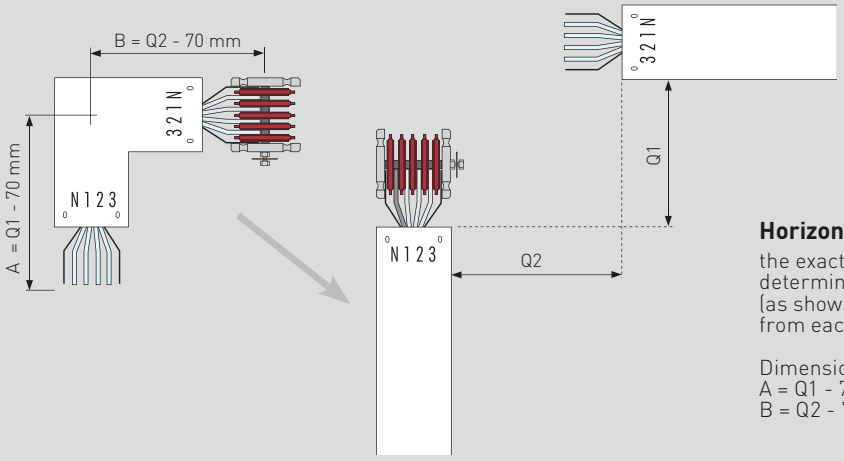


The exact length of the piece to be ordered can be determined by measuring the distance between the elements (as shown in the picture) and then subtracting 285 mm from the dimension that has been taken

Length of element = Q - 285 mm

Example: Dimension measured Q = 2500 mm
Order a element (2500 - 285) = 2215 mm

Measurement of the size for the ordering of a special path element



Horizontal elbow

the exact length of the piece to be ordered can be determined by measuring the dimensions Q1 and Q2 (as shown in the picture) and then subtracting 70 mm from each dimension that has been taken

Dimension of the element to order:
A = Q1 - 70 mm
B = Q2 - 70 mm

Compact BUSWAYS - HE

suggestions for the project development

1. Rating

2500 A

2. Application:

Transport ☐

Distribution ☐ No. of outlets .....

3. Icc at the beginning of the line .....kA

4. Material:

Copper ☑

5. Degree of protection:

IP55 (standard) ☑

IP65/IP66 ☐

6. Painting :

RAL7035 (standard) ☑

Different RAL

colour on request ..... ☐

7. Neutral section:

100% (standard) ☑

200% 2N ☐

8. Nominal ambient

temperature:

50°C (standard) ☑

Other on request..... ☐

9. Attach Busbar layout*

Drawing ☑

Dwg file ☐

10. PE cross section

→= 50% ☑

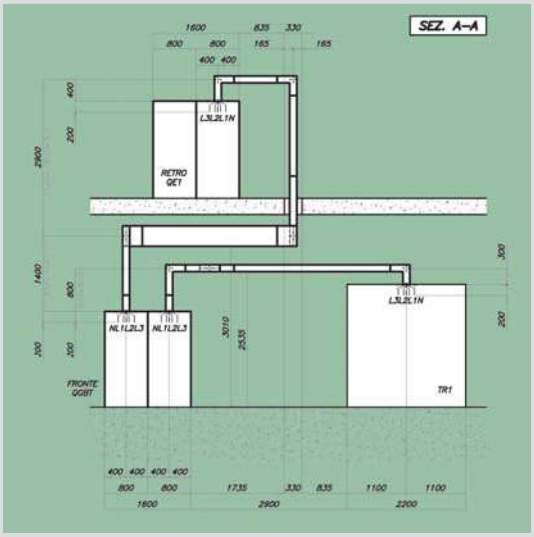
→= 100% ☐

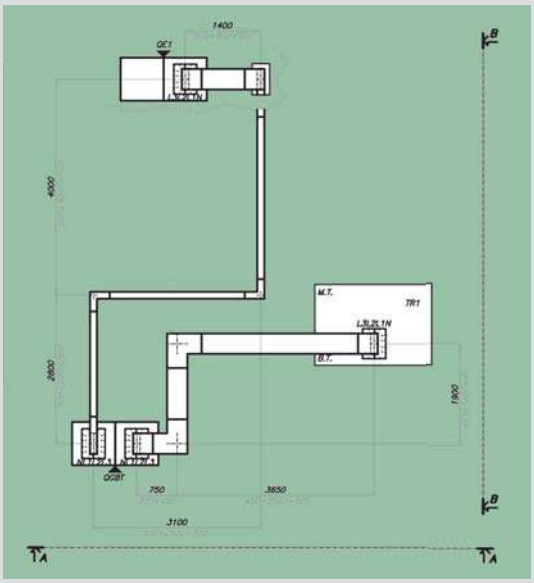
Example for quotation check list:

Checklist to be done during the project

1. Verify the measurements of the drawings, the correct position of the equipment (HV/LV transformer and LV electric board enclosures)
2. Check the availability of drawings required (transformer, electric board, etc.)
3. Check for the existence of unforeseen obstacles in the installation which could impede the run of the Busbar (for example pipelines, ventilation and air-conditioning ducts)
4. Agree upon who is responsible for providing the connection from the Busbar to the other devices (HV/LV transformer and LV electric boards)

Example of detail of the project





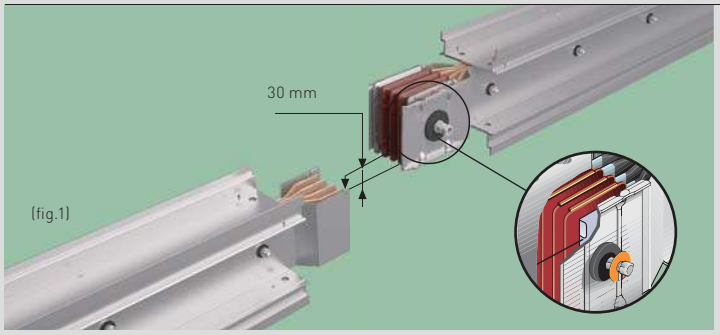
Bahra TBS provides without charge, if required:

- The mechanical layout of the project
- Study of the connections between the Busbar and the transformer or between electric board enclosures
- Suggestions for the type of fixing (floor, wall, ceiling...)
- Possibility of site measurement by qualified persons
- Telephone assistance during the entire installation stage by the Engineering Design Office

Compact BUSWAYS - HE

installation guidelines

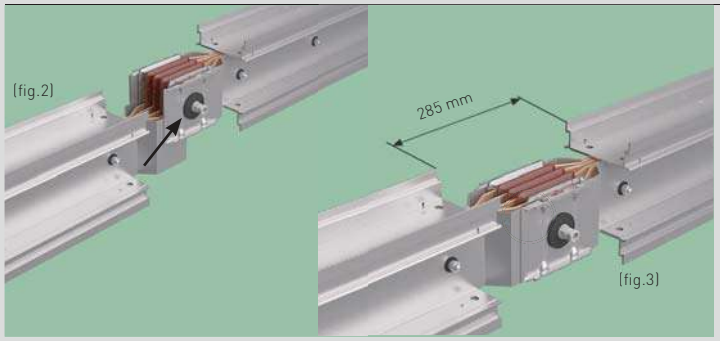
Installation sequence of the junction



The installation instructions are placed on every element near the junction

Make sure that the contacts are clean

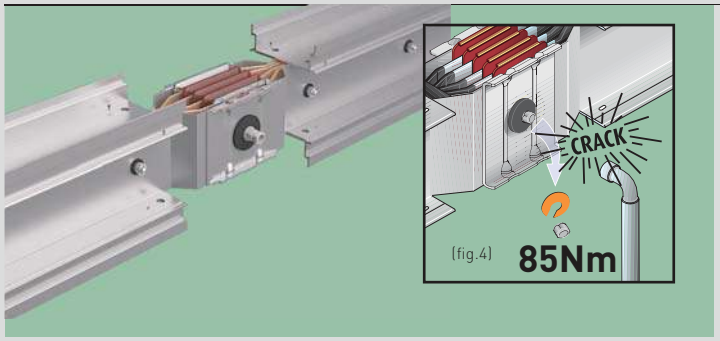
Join the two elements together (Fig.1)



Make sure that the earth plate of the straight element is inserted behind the front plate of the junction monobloc (Fig.2)

The positioning pin on the monobloc should be fitted into the corresponding slot on the earth plate

Verify the distance between elements, 285mm, before tightening the monobloc completely (Fig.3)

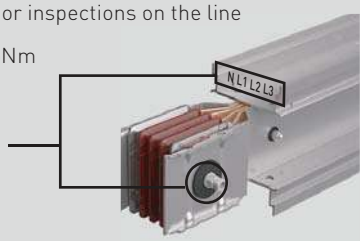


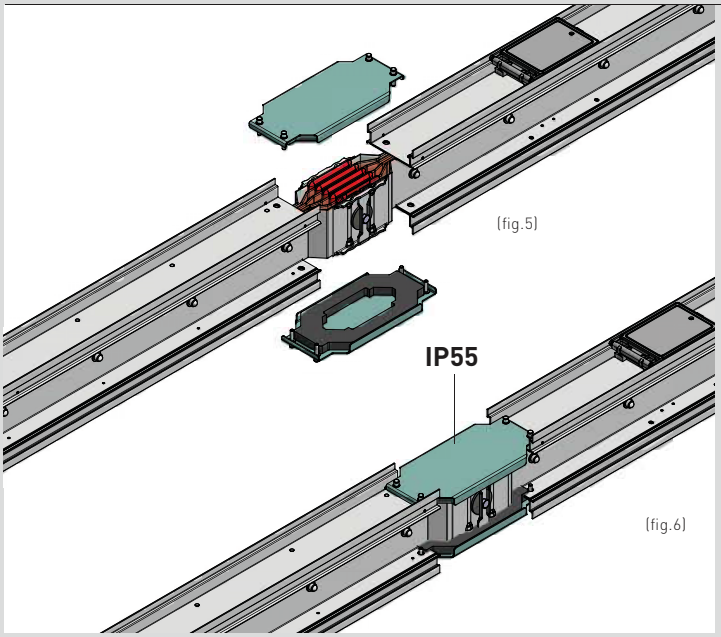
Tighten the bolt of the monobloc until the 1st head breaks off (Fig. 4).

The bolt that tightens the monobloc has a second head which is used when carrying out operations or inspections on the line

The nominal tightening torque is 85Nm

In standard execution the self-shearing nut is fitted on the opposite side of the Neutral.





Install the covers of the junction (fig. 5)

Connection completed correctly with Protection degree IP55 (fig.6)

Compact BUSWAYS - HE

mechanical design precautions

Below are some precautions that may be useful to avoid problems during the assembly, which we recommend should be taken into account during the design

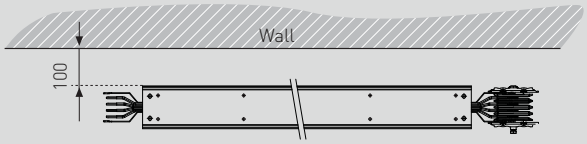
Minimum distances from the structure

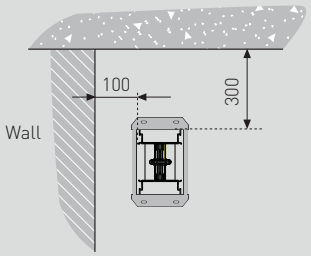
The minimum distance from the walls, to avoid problems during edgewise installation of the busbar, is 300 mm
The variables that must be taken into account for correct assembly are:

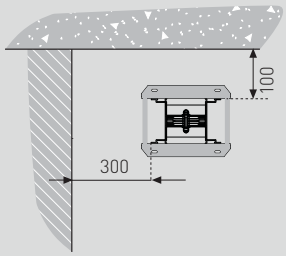
- position of the bolt for tightening the Monobloc; the minimum required distance is 100 mm;
- sizes of the distribution element (box) selected for the collection of power (at least 300 mm);
- any brackets and their assembly;
- accessibility to the screws for the installation of the brackets and the closing of the junctions;
- any material required for the actual installation in order to compensate for wall imperfections

In case of rising mains installation, if the system does not require fire barriers, the bracket supporting the bracket can be directly secured to the wall. Otherwise, allow for a spacing support between the bracket and the wall, to ensure that the back of the busbar remains at a distance of 100 mm from the wall, therefore ensuring enough space for the positioning of the partitions

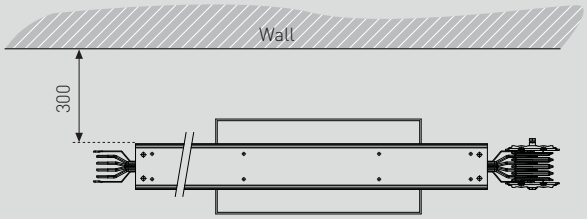
Minimum distance of the wall / ceiling elements

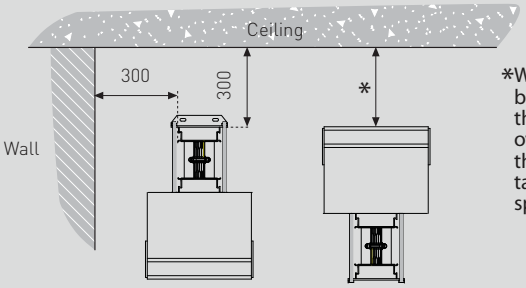




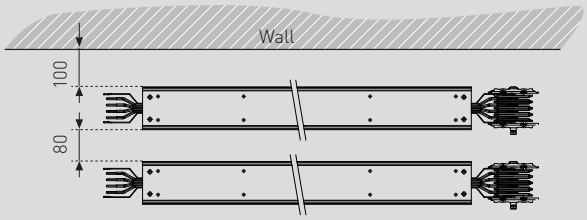


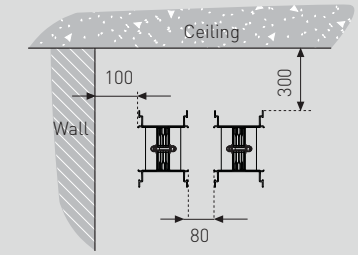
When there are tap-off units along the busbars, the minimum distances depend on the dimensions of the tap-offs selected



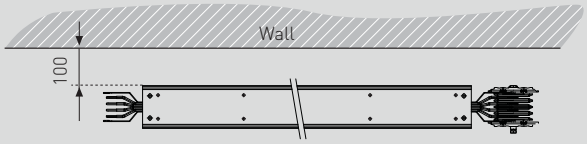


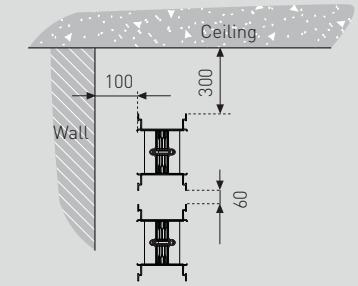
*When there is a tap-off box installed above the busbar, check the overall dimension of the open cover of the tap-off unit used in the specific section





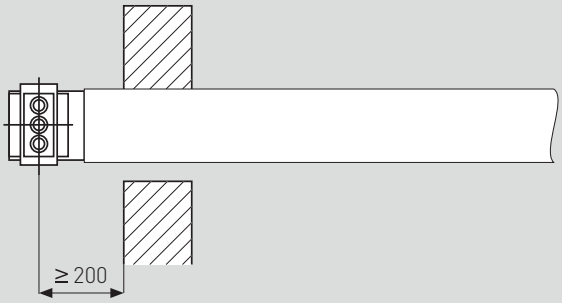
Minimum installation distance when there are several adjacent lines

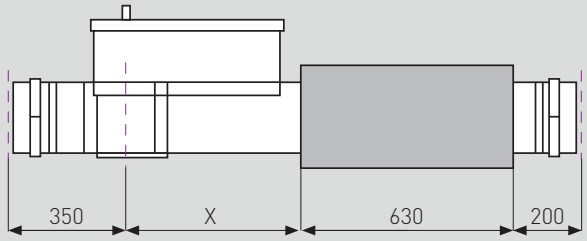


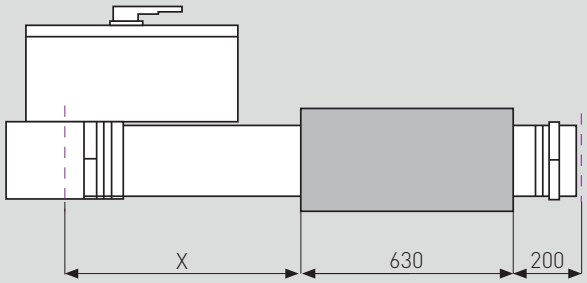


Minimum installation distance when there are several overlapped lines

The minimum distance from the junction to the point the busbar crosses the wall or other structure must be at least 200 mm, to ensure the junction of the junctions
In case plug-in boxes and fire barriers are required on the same element the minimum distance between the box and the partition must be taken into account, at the same time allowing for the necessary free space in the junction area and the minimum distance between the distribution outlet and the start of the element
By taking all these variables into account, it is possible to obtain the minimum size of the element in order be able to fit the partition and the plug-in box. The tables that follow summarise the minimum sizes







Refered to Copper

PLUG-IN TAP OF BOXES (X MINIMUM SIZE)		
Type	**Rating (A)**	**X (mm)**
1	63 – 160	500
2	250 – 630	720

Refered to Copper

PLUG-IN BOXES ON THE JUNCTION		
Type	**Rating (A)**	**X (mm)**
3/4	125 – 400	700
3/4	630	820
3/4	800 – 1250	1120

Connection to the board

As a rule, the manufacturer of the board is responsible for connecting the connection element and the distribution busbars inside the board
On request Bahra TBS may develop and supply the connections, subject to all necessary details being available
All types of connections must be agreed and checked with the board manufacturer

Short circuit withstand

The short circuit withstand of the connection elements depends on the connection of the busbars inside the distribution board
The declaration of short circuit withstand for the system busbars may only be supplied by the board manufacturer. When using Bahra TBS boards and Bahra TBS busbar trunking system it will be possible to obtain a short circuit certification

Compact BUSWAYS - HE

technical information

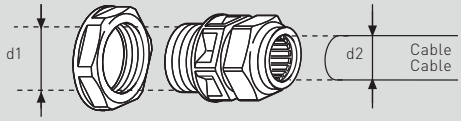
Table of comparison between boxes and cable glands (Bahra TBS)

The following table shows the maximum number of Bahra TBS cable glands that can be installed on Plug-in boxes using the appropriate flanges

COMPARISON TABLE BETWEEN Plug-in boxes AND CABLE GLANDS (Bahra TBS)						
	Useful dimension for the passage of the cables and flange size	**M16-PG9 (63 A cable) 10 mm2 section PVC insulated one-pole cable**	**M20-PG13.5 (63 A cable) 10 mm2 section PVC insulated one-pole cable**	**M25-PG21 (250 A cable) 70 mm2 section PVC insulated one-pole cable**	**M32-PG29 (400 A cable) 150 mm2 section PVC insulated one-pole cable**	**M40-PG36 (630 A cable) 300 mm2 section PVC insulated one-pole cable**
63/160 A Plug-in box with section cover (Type 1)	80 x 70 FL 110 x 100	No. 10	No. 5	—	—	—
250/630 A Plug-in box with section cover (Type 2)	150 x 220 FL 235x 180	No. 66	No. 36	No. 20	No. 13	No. 8
125/400 A Plug-in box on the junction (Type 3/4)	130 x 180 FL 180 x 230	—	No. 30	No. 16	No. 9	—
630 A Plug-in box on the junction (Type 3/4)	270 x 160 FL 340 x 230	—	—	No. 28	No. 15	No. 10
800/1250 A Plug-in box on the junction (Type 3/4)	380 x 210 FL 430 x 260	—	—	No. 57	No. 32	No. 18

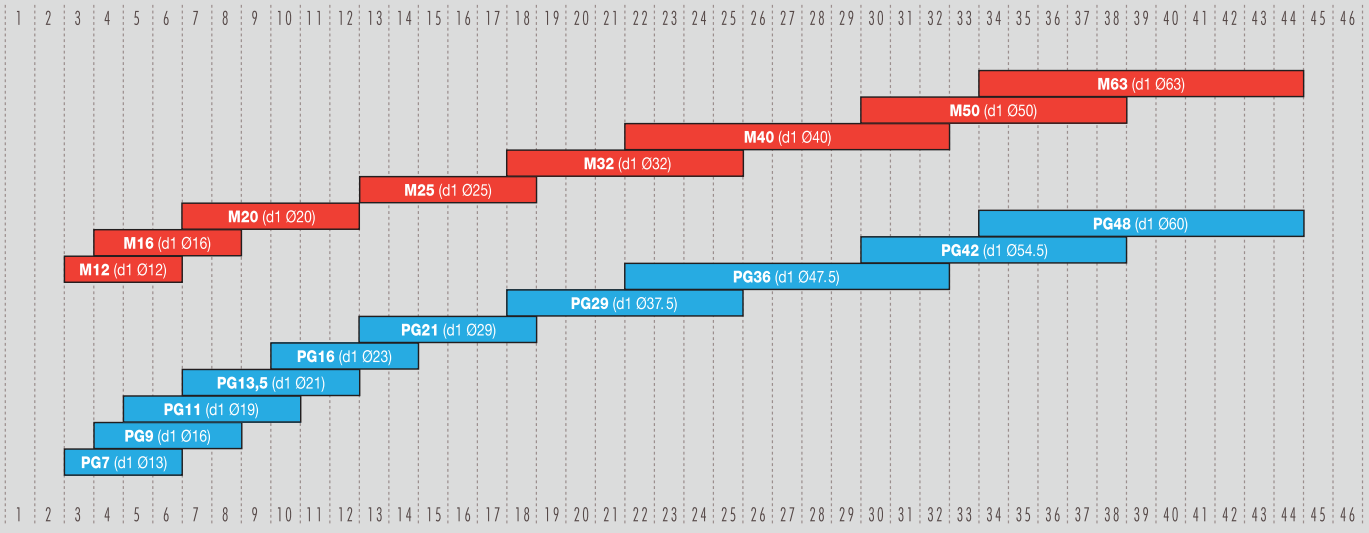
Note: The value shown on the table is the max no. of PG that may be installed in the cable flange
For boxes with section cover the most demanding condition is considered, which means that only one of the two cable flanges is used

Cable glands table



When choosing the cable glands, please refer to the Bahra TBS catalogue

Dimension d2 Ø cable [mm]



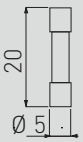
Dimension d2 Ø cable [mm]

Ceramic fuse 5 x 20

Operating features

In = 6.3	1.5 In	2.1 In	2.75 In	4 In	10 In
Operating time	**> 1 h**	**< 30 min**	**10 ms - 3 s**	**3 ms - 30 ms**	**< 20 ms**

When choosing all fuses, please refer to the general Bahra TBS catalogue



Quick fuse

- I_n = 6.3A
- U_e 250V ceramic fuse IEC 127
- Breaking capacity H 1500A
- Voltage drop ΔV = 150 mV
- I^2t = 48A ^{2}s

Joule effect losses in busbars

Technical information

Losses due to the Joule effect are essentially caused by the electrical resistance of the busbar
Lost energy is transformed into heat and contributes to the heating of the conduit of the environment
The calculation of power loss is a useful data for correct sizing of the building air conditioning system

Three-phase regime losses are:

$$Pj = \frac{3 \cdot Rt \cdot Ib^2 \cdot L}{1000}$$

In one-phase regime:

$$Pj = \frac{2 \cdot Rt \cdot Ib^2 \cdot L}{1000}$$

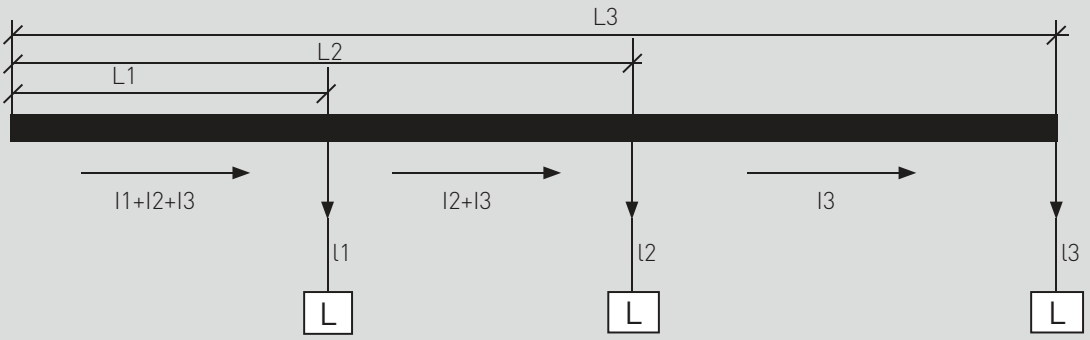
Where:

I_b = Utilisation current (A)
R_t = Phase resistance for unit of length of the busbar trunking system, measured at thermal regime (mΩ/m)
L = Busbar length (m)

For accurate calculation, losses must be assessed trunk by trunk taking into account the transiting currents; for example, in the case of the distribution of the loads represented in the figure one has:

	Length	Transiting current	Losses
1st trunk	L1	I1+I2+I3	$P1 = 3R_t L1 (I1+I2+I3)^2$
2nd trunk	L2-L1	I2+I3	$P2 = 3R_t (L2-L1) (I2+I3)^2$
3rd trunk	L3-L2	I3	$P3 = 3R_t (L3-L2) (I3)^2$

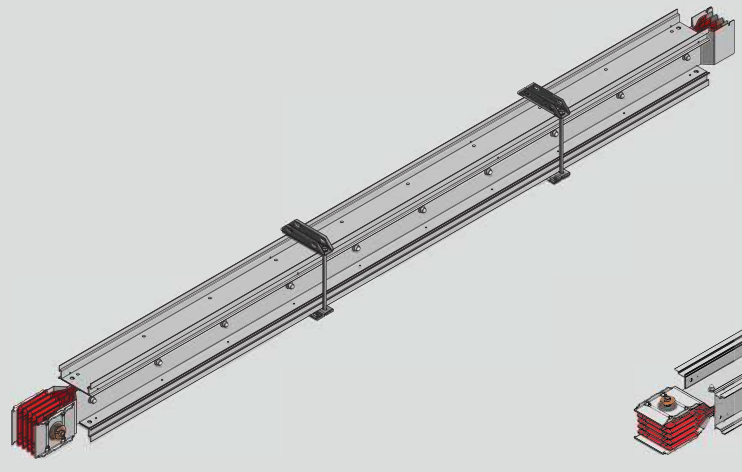
Total losses in the busbar trunking system Pt = P1+P2+P3



Losses based on the installation method

Thermal dispersion, rating and IP protection degree are independent from the type of installation (edgewise, flat, vertical)

This means that it is possible to install the Bahra TBS busbar trunking system as preferred, without having to consider a possible system downgrading



Edgewise element

Flat element

Overload protection

Technical information

Busbar overload protection is ensured following the same criteria used for cables. It will be necessary to check the relationship:

$I_b \leq I_n \leq I_z$

Where:

I_b = Circuit utilisation current
I_n = Switch rated current
I_z = Rating at permanent cable regime

The lb utilisation current in a tree-phase system is calculated baseon td he following formula:

$$I_b = \frac{P_t \bullet \alpha \bullet \beta \bullet d}{\sqrt{3} \bullet Ue \bullet \cos\varphi_{medium}} [A]$$

Where:

P_t = Sum of the active powers of the loads installed [W]
d = Power supply factor equal to:
1 if the trunking is only powered from one side;
if the trunking is powered from the centre or
from both ends at the same time
Ue = Operating voltage in [V]
cos m = Average power factor of the loads
I_b = Operating current [A]
α = Diversity coefficient of the loads [.]
β = Coefficient of utilisation of the loads [.]

The ambient temperature where the busbar trunking system is installed impacts on its rating
During the design stages, it will be necessary to multiply the rating value at the reference temperature by a correction coefficient referred to the final operating temperature

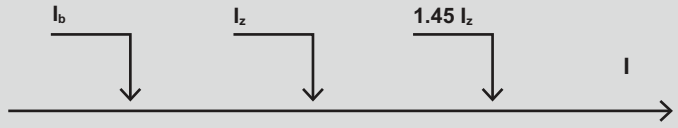
All Bahra TBS products have been sized and tested for an average ambient temperature of 35 °C. For installation in environments with average daily temperatures lower than 35 °C, the rated current of the busbar must be multiplied by a k1 factor, which is higher than the unit for temperatures lower than 35 °C, and lower than the unit if the ambient temperature is higher than 35 °C:

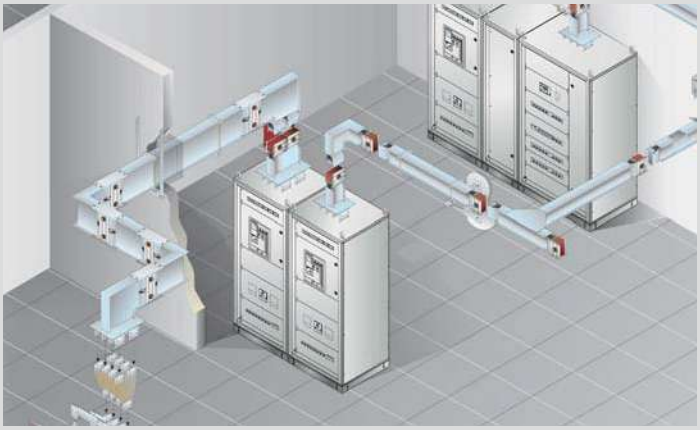
$I_z = I_z0 \cdot Kt$

Where:

- I_z0 is the current that the busbar trunking system can carry for an indefinite time at its reference temperature (35 °C)
- **Kt** is the correction coefficient for ambient temperature values other than the reference temperature, as shown in the following table

OVERLOAD PROTECTION CONDITIONS





Selection of the busbar trunking system based on voltage drop

Technical information

If the line is particularly long (→ 100 m), it will be necessary to check the value of the voltage drop. For systems with power factor (cos φm) not lower than 0.7 the voltage loss can be calculated using the following formulas:

THREE PHASE SYSTEM

$$\Delta v = \frac{b \cdot \sqrt{3} \cdot I_b \cdot L \cdot (R_t \cdot \cos\varphi m + x \cdot \sin\varphi m)}{1000}$$

ONE-PHASE SYSTEMS

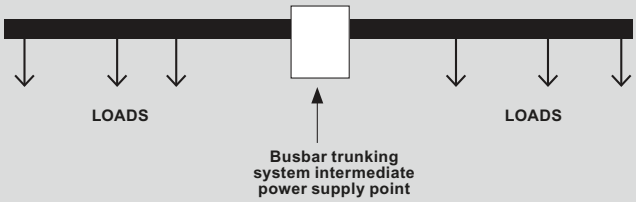
$$\Delta v = \frac{b \cdot 2 \cdot I_b \cdot L \cdot (R_t \cdot \cos\varphi m + x \cdot \sin\varphi m)}{1000}$$

The percentage voltage drop can be obtained from:

$$\Delta v\% = \frac{\Delta v}{Vr} \cdot 100$$

Where Vr is the system rated voltage

In order to limit the voltage drop in case of very long busbar trunking systems, it is possible to allow for a power supply at an intermediate position, rather than at the terminal point



Calculation of the voltage drop with loads not evenly distributed

In case the load cannot be considered evenly distributed, the voltage drop may be determined more accurately using the relationships shown below
For the distribution of three-phase loads, the voltage drop can be calculated using the following formula, on the assumption (generally verified) that the section of the busbar trunking system is consistent:

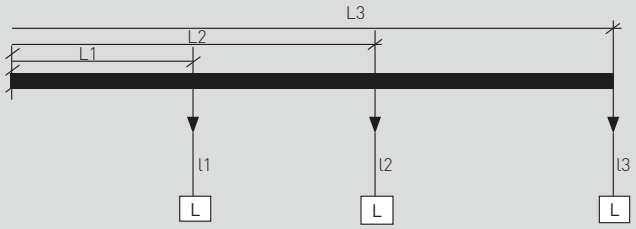
$\Delta v = \sqrt{3}$ [Rt (I1L1cos φ1 + I2L1 cos φ1 + I3L3 cos φ3)
+ x (I1L1sin φ1 + I2L2 sin φ2 + I3L3 sin φ3)]

In general terms this becomes:

$$\Delta v = \frac{\sqrt{3}(R_t \cdot \sum Ii \cdot Li \cdot \cos\varphi mi + x \cdot \sum Ii \cdot Li \cdot \sin\varphi mi)}{1.000}$$

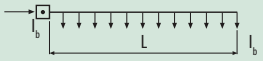
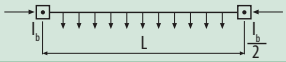
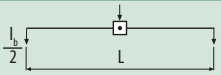
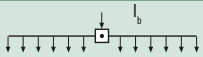
If the three-phase system and the power factor are not lower than cos φ = 0.7, the voltage loss may be calculated using the voltage drop coefficient shown in Table 1

$$\Delta v\% = b \cdot \frac{k \cdot Ib \cdot L}{Vn} \cdot 100$$



The current distribution factor "b" depends on how the circuit is fed and on the distribution of the electric loads along the busbar:

Table 1 - The distribution factor of the current "b"

b = 1	Supplies at one end and load at the end of the line	
b = 1/2	Supplies at one end and with load evenly distributed	
b = 1/4	Supplies at both ends and with load evenly distributed	
b = 1/4	Central supply with loads at both ends	
b = 1/8	Central supply with load distributed evenly	

Short circuit withstand

Technical information

The CEI 64-8 standard indicates that, for the protection of the circuits of the system, it is necessary to allow for devices aimed at interrupting short circuit currents before these become dangerous due to the thermal and mechanical effects generated in the conductors and the connections
In order to size the electric system and the protection devices correctly, it is necessary to know the value of the estimated short circuit current at the point where this is to be created
This value enables in fact to correctly select protection devices based on their own tripping and closing powers, and to check the resistance to electro-dynamic stress of the busbar supports installed in control panels, or/and of the busbar trunking systems

Characterisation of short circuit current

The estimated short circuit current at a point of the user system is the current that would occur if in the considered point a connection of negligible resistance was created between conductors under voltage
The magnitude of this current is an estimated value that represents the worst possible condition (null fault impedance, tripping time long enough to enable the current to reach the maximum theoretical values)
In reality, the short circuit always occurs with significantly lower effective current values

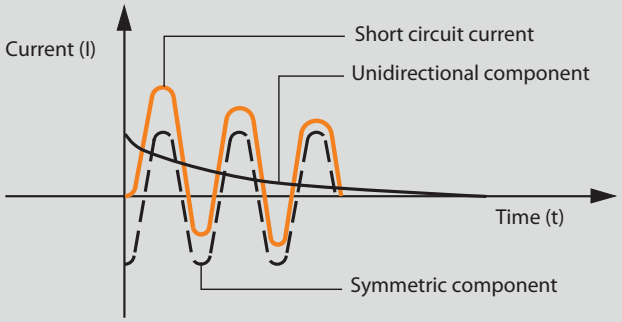
The intensity of the estimated short circuit current essentially depends on the following factors:
• Power of the cabin Transformer, meaning that the higher is the power, the higher is the current;
• length of the line upstream

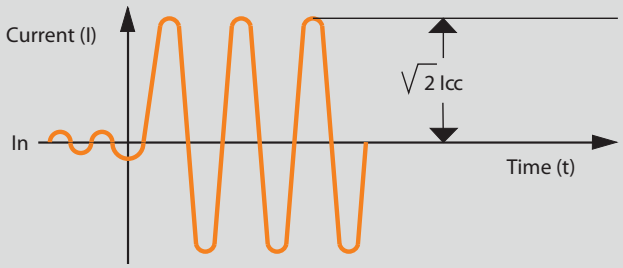
In three-phase circuits with Neutral it is possible to have three different types of short circuit:
- phase-phase;
- phase-Neutral;
- balanced three-phase (most demanding condition)

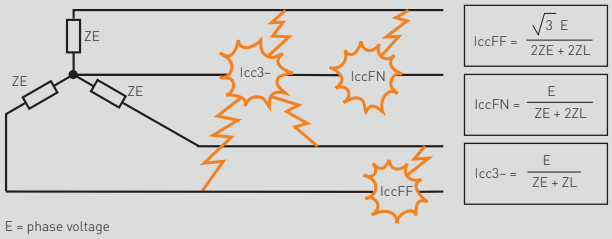
The formula for the calculation of the symmetric component is:

$$\overline{Icc} = \frac{\overline{E}}{\overline{ZE}+\overline{ZL}}$$

Where:
- **E** is the phase voltage;
- **ZE** is the secondary equivalent impedance of the TRANSFORMER measured between the phase and the Neutral;
- **ZL** is the impedance of the phase conductor only





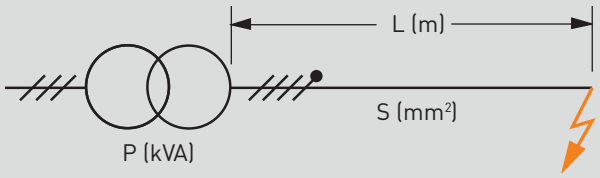


E = phase voltage

Short circuit withstand (continued)

Analytical determination of short circuit currents

In order to calculate the value of the estimated short circuit current at any point of the circuit, it is sufficient to apply the formulas shown below, knowing the impedance calculated at the origin of the system up to the point being assessed
In the formulas shown below, the value of the short circuit power is considered infinite and the short circuit impedance is equal to 0.
This makes it possible to define short circuit current values higher than the actual ones, but generally acceptable



Line resistance $RL = r \cdot L$	**RL** = resistance of the line upstream (m) **r** = specific line resistance (m/m) **L** = upstream line length (m)
Line reactance $XL = x \cdot L$	**XL** = upstream line reactance (m) **x** = specific line reactance (m/m)
TRANSFORMER resistance $RE = \frac{1000\ Pcu}{3In^2}$	**RE** = transformer secondary equivalent resistance (m) **Pcu** = transformer COPPER losses (W) **In** = transformer Rated current (A)
TRANSFORMER impedance $ZE = \frac{Vcc\%\ V^2c}{100\ P}$	**ZE** = transformer secondary equivalent impedance (m) **Vc** = phase voltage (V) **Vcc%** = percentage short circuit voltage **P** = transformer power (kVA)
TRANSFORMER reactance $XE = \sqrt{ZE^2 - RE^2}$	**XE** = transformer secondary equivalent reactance (m)
Short circuit impedance $Zcc = \sqrt{(RL + RE)^2 + (XL + XE)^2}$	**Zcc** = total short circuit impedance (m)
Estimated short circuit current $Icc = \frac{Vc}{\sqrt{3}} \cdot Zcc$	**Icc** = symmetric component of the short circuit current (kA)

COPPER				
Rating (A)	kA three-phase Icw	Ipk three-phase Ipk	kA one-phase Icw	kA one-phase Ipk
800	45	95	27	57
1000	45	95	27	57
1250	50	105	30	63
1600	60	132	36	76
2000	60	132	36	76
2500	88	194	53	116
3200	88	194	53	116
4000	176	387	106	232
5000	176	387	106	232

Technical information

In a distribution system, currents and voltages should have a perfectly sinusoidal shape. However, in practice the equipment contains electric devices such as changeover devices or dimmers that make the load not linear

The currents absorbed, although at regular intervals and with frequencies equal to that of the rated voltage, sometime have a non-sinusoidal wave form, which has the following negative effects:

- worsening of the power factor;
- heating of the Neutral;
- additional losses in electric machinery (transformers and motors);
- instable operation of the protection elements (thermal magnetic and earth leakage circuit breakers)

In industrial plants these conditions have been occurring for a long time, However, they are now occurring more and more in service sector distribution systems, where, from backbone distribution (which uses three-phase lines), one-phase loads are often distributed, which contributes to increasing the unbalance of the electric system

Each type of non-sinusoidal periodical wave may be split into a more or less large number of sinusoids (called harmonic components), which frequency a whole multiple of the frequency of the wave shape observed

A deformed current at a frequency of 50 Hz, like for example that represented by the red line on the figure, consists of many sinusoidal currents with frequency of 50 Hz (fundamental), 100 Hz (second harmonic components), 150 Hz (third harmonics), and so on

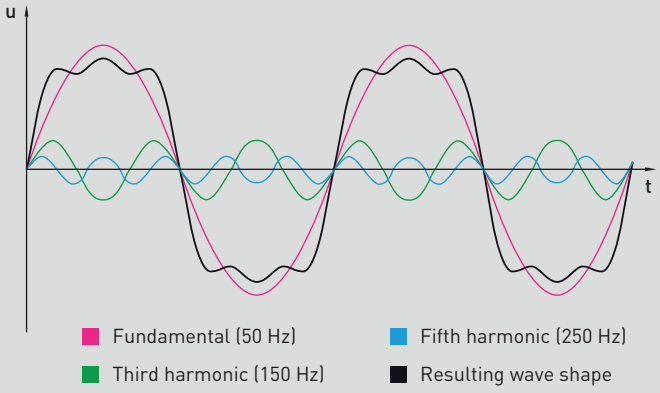
The presence of current harmonics represents an important problem, causing overload conditions both on phase conductors, and on any Neutral conductor, and results in the reduction of the conductor permitted load

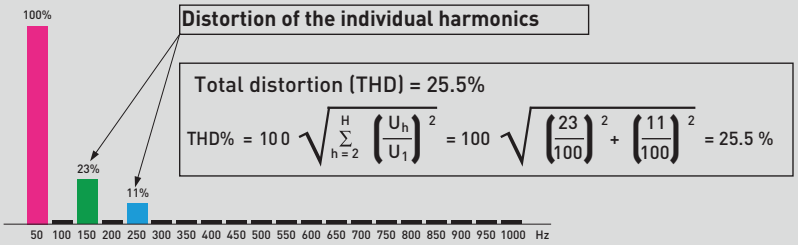
Choice of the rating when in the presence of harmonics

When in the presence of harmonics, and when using the chosen rated current, the busbar to be used shall have the rating specified in the below table

Rated current	800 A	1000 A	1250 A	1600 A	2000 A	2500 A	3200 A	4000 A	5000 A
Bahra TBS busbar to be used:									
THD ≤ 15%	800 A	1000 A	1250 A	1600 A	2000 A	2500 A	3200 A	4000 A	5000 A
15% ← THD ≤ 33%	1000 A	1250 A	1600 A	2000 A	2500 A	3200 A	4000 A	5000 A	—
THD → 33%	1250 A	1600 A	2000 A	2500 A	3200 A	4000 A	5000 A	—	—

Measurement of harmonic distortion carried out with a network analyser





Distortion of the individual harmonics

Total distortion (THD) = 25.5%

$$THD\% = 100\sqrt{\sum_{h=2}^{H}\left(\frac{U_h}{U_1}\right)^2} = 100\sqrt{\left(\frac{23}{100}\right)^2 + \left(\frac{11}{100}\right)^2} = 25.5\,\%$$

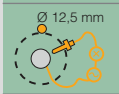
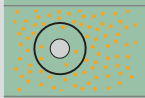
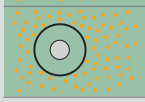
Degrees of protection

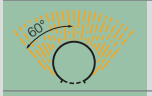
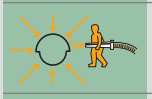
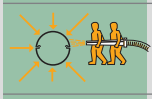
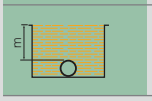
IP: degree of protection provided against intrusion

IP

The protection enclosures are classified (IEC 60529) in according to their degree of protection against weather conditions and external agents. The degree of protection is indicated by two digits (protection against solid bodies and liquids) following the symbol IP

To increase the ease of choice of the most suitable busbar, in according to installation requirements, below there is a summary of their performance, based on the IP degree of protection according to the IEC 60529 standard

1st digit IP		
Protection against penetration of solid bodies		
	0	No protection
	1	Protection against solid bodies larger than 50 mm (e.g.: accidental contact)
	2	Protection against solid bodies larger than 12 mm (e.g.: finger)
	3	Protection against solid bodies larger than 2.5 mm
	4	Protection against solid bodies than 1 mm
	5	Protection against dust
	6	Complete protection against dust

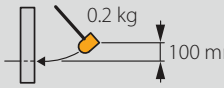
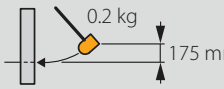
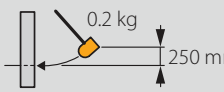
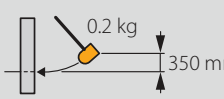
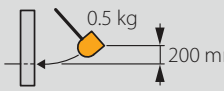
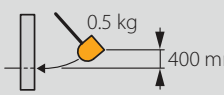
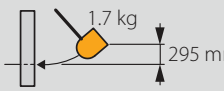
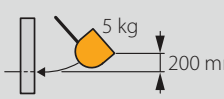
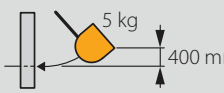
2nd digit IP		
Protection against penetration of liquids		
	2	Protection against drops of water falling up to 15° from the vertical
	3	Protection against drops of water up to 60° from the vertical
	4	Protection against sprays of water from all directions
	5	Protection against jets of water from all directions
	6	Protection against jets of water (similar force to heavy seas)
	7	Protection against the effects of immersion
	8	Protection against effects of immersion under pressure

Degrees of protection

IK: degree of protection of equipment to mechanical impact

IK

Standard IEC 62262 defines an IK code that characterises the aptitude of equipment to resist mechanical impacts on all sides

IK	Test	Impact energy (In joules)
IK 00		0
IK 01		0.15
IK 02		0.2
IK 03		0.35
IK 04		0.5
IK 05		0.7
IK 06		1
IK 07		2
IK 08		5
IK 09		10
IK 10		20

NOTES

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