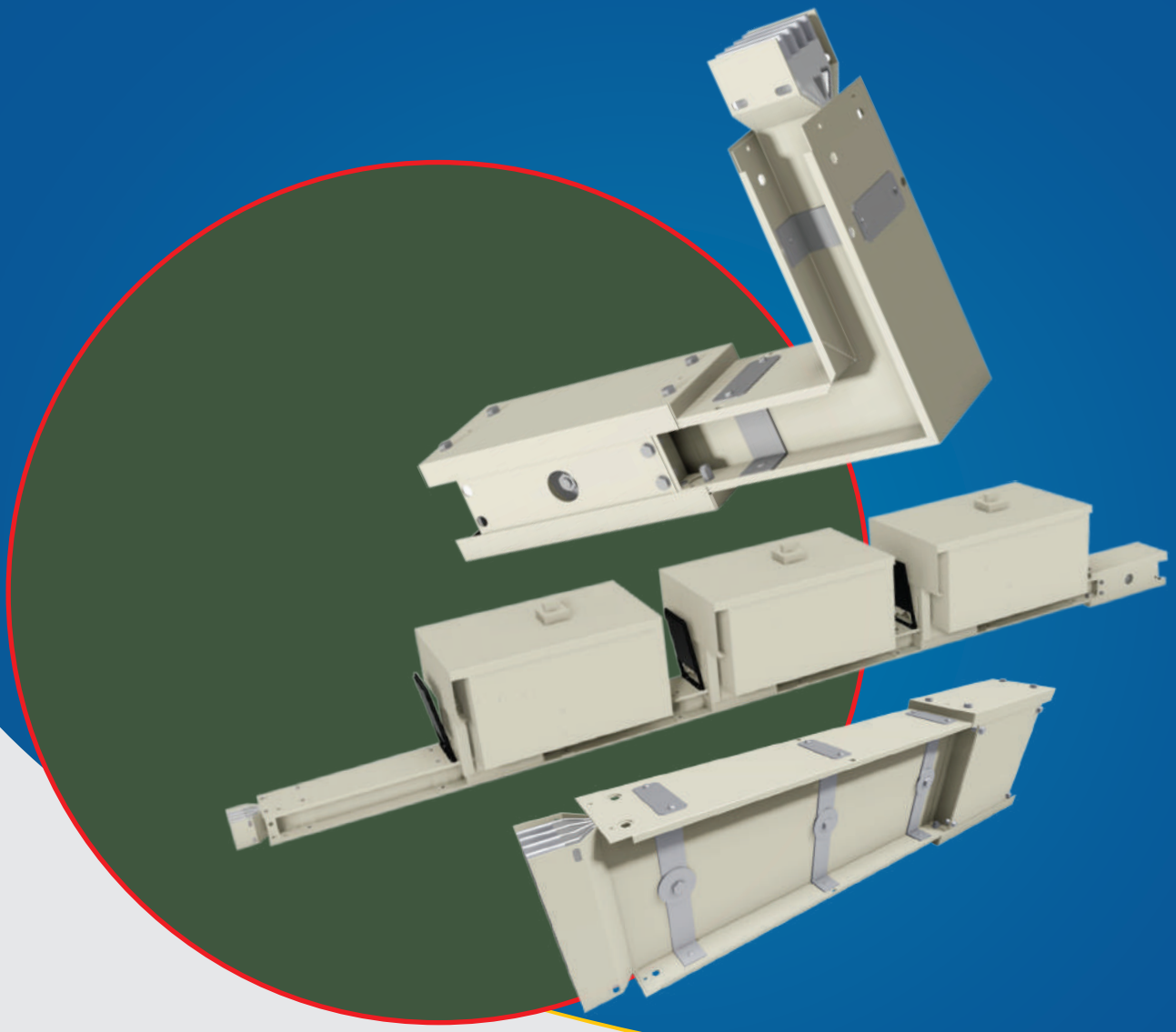
SANDWICH TYPE

BUSBAR TRUNKING SYSTEMS



Comprehensive solutions

from design to delivery

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Reliable solution

TECHNO Busbar Trunking System is a flexible and reliable electrical distribution system with superior performance. It is a safe and robust system with high electrical efficiency, low temperature rise, efficient heat dissipation, low voltage drop, high mechanical strength and easier to install. It is suitable for alternating current three-phase three-wire, threephase four-wire and three- phase five-wire power supply and distribution system, with frequency 50~60Hz, rated insulation voltage up to 1000V, and rated current 25A-5000A.

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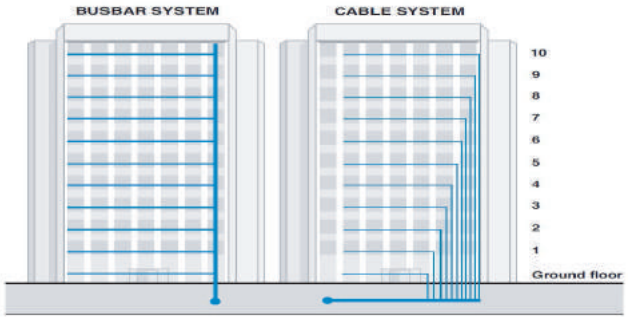
ADVANTAGES

Fail-safe behaviour

Because of its specific highlights, a busbar trunking system doesn't regularly uses excess amount of plastic material as insulation which is conceivably risky material if there should arise an occurrence of fire. Besides, plastic material utilized for the insulating parts of busbar trunking system are self-extinguishing type (from V0 to V2) and for the most part have low smoke discharge (Halogen Free). Busbar trunking system is in its low electromagnetic discharge compared to conventional cable system. The structure of Busbar Trunking System considerably reduces the magnetic component and the shielded enclosure serve as shield of electric field. All these feature of busbar trunking system is the best choice for emergency clinic offices, information and data center and any place it is important to supply higher amount of power for working environments.

Flexible

The Busbar Trunking system provides high level of flexibility both during the planning stage and during installation of the system as a result of using tap off box outlets situated on the straight lengths. Keeping the busbar line live, tap-off box can be remove from one outlet and can be inserted in another tap-off outlet. During designing the busbar trunking system it is not necessarily need to know the exact position of machines that will be installed in the building. The designer's plan will take into consideration the endcustomer's modifications and variations which will be determined during the operation of the system. No more point-to-point connections but just one power distribution system where power can be tapped-off wherever there is a free tap-off point. Due to its flexible and long-lasting features, the installation of Energypac's busbar in a building allows easy modification of its use within business premises, thus providing benefits even to those who manage and rent out different parts of the building.



Quick Installation

TECHNO BBT joining sysytems have been made and design to allow easy installataion of basbar trunking systems. When using a traditional cable system, the time needed to install only one cable tray is equal the same time needed to install a complete system in a busbar trunking system. Furthermore, given the same capacity, a busbar trunking system is much lighter than an equivalent one made with cable trays and (copper) cables: lighter weights require a lower number of supports or, at least simpler amd less expensives supports.This is why the time to install a busbar trunking system is obviously shorter than a similar traditional cable installation.

Reduced dimensions

The traditional cable system requires more dimensional space than busbar trunking system, especially when the currents to be carried exceed 1000A and when several cables in parallel are required to ensure such ratings. Moreover, cables have a minimum bending radius to avoid damage to the insulation; the busbar trunking systems allow route changes with 90° angles, thus maximising the use of the reduced spaces available within technical premises.

Easy to rate

The electrical rating of busbar trunking systems is carried out by Energypac in compliance with the product Standards. The rated current of Energypac busbars is guaranteed for room temperatures at 40°C (the Standard requires 35°C). After choosing the appropriate current requirements for the busbar, it is extremely easy to check the voltage drop as well as the protection against over currents. To do so, use the technical charts available for all Energypac product lines. These charts basically specify: the short-circuit currents and the peak current withstand of the busbar while waiting for the protection device to start operating upstream, the voltage drop of the average cos θ of the loads, the losses as well as a series of additional data (R, X, Rpe, etc.) which allow the designer to make calculations using the results from tests carried out in accredited LOVAG laboratories for heat and short-circuit tests. With busbar trunking systems, the protection device is located close to the load (decentralized protection); as a result, protection devices such as thermal magnetic circuit breakers, fusecarriers and motorized switches can be housed in the tap-off boxes, thus allowing easy and effective management of the system.

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PRODUCT RANGE

LX	Lighting BBT	25A-63A	Low Power
AX	Air Insulated BBT	160A-1000A	Medium Power
EX	Sandwich BBT	800A-5000A	High Power

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EX - SANDWICH BBT

General features

The compact system EX line is used for the distribution of power in large industries, for riser end feed units and for commercial and service sector buildings (banks, hospitals, trade and business centers, etc.).
The ultra-compact dimensions of the EX enhance the short-circuit stress resistance features, reduce the impedance of the circuit by limiting voltage drops and enables the installation of high power electrical systems even in extremely cramped spaces.
Any section can be taken out without moving the adjacent ones. At any moment it is possible to modify the path of the run, which makes EX a very flexible system.
Energypac EX can be installed quickly. It is easy to manage and suitable for modifications and extensions, which is always necessary for installations where EX is used.
EX has a wide range of tap-off boxes rated from 25A to 1250A, thus allowing the supply and protection of all kinds of loads due
to the availability of different protection devices such as fuses, moulded case circuit breakers and motorised switches.
Standard
• Complies with international and domestic standards.
• Complies with IEC61439-1 e IEC61439-6
Number of conductor
• 4 Conductor (3P+N)
• 5 Conductor (3P+N+PE)

Construction

Conductor type

• Aluminum
• Copper

The conductors are made from an aluminum alloy with a final coat of tin. Alternatively, the EX range is available with copper conductors with purity no less than 99.9% (electrolytic copper). The low inherent impedance and large surface area of the busbars limit the heat buildup. The conductor also lowers the voltage drop.

Casing

The enclosure is made of prepainted galvanized sheet which also provides an excellent earthing path through the busbar system due to its cross-section and electrical continuity.

Thickness: 1.6 mm

Color: RAL 9002 (grey white)

Rating

• 400A to 4000A for Aluminum conductors
• 800A to 5000A for Copper Conductors

Degree of protection: IP 55

Joint

An electrical junction "monobloc" system for fast and reliable connection of the live conductors and PE between different busbar pieces. Monobloc consists of insulating plate (Class F), blocking element and copper plates. Considering all significant factors including contact resistance and contact corrosion, Cu-Al combination is selected in order to obtain best contact solution. Depending on the height of the busbars, the joint has either one or two bolts to guarantee optimum electrical continuity over time. The protective conductor (PE=casing) is also connected through the monobloc. A pair of belleville washers for each bolt ensures the correct distribution of the contact pressures as well as maintaining the pressure even when exposed to the temperature ranges, during the operation of a busbar trunking system. In order to simplify the storage and speed up the installation of the line, straight lengths, trunking components and all components of the EX line are already fitted wit h a monobloc pre-installed at the factory .

Testing

Each piece of Energypac busbar is factory tested before shipping. Tests performed include dielectric tests, which are used to ensure integrity of insulation. In addition, Energypac busbar is qualified IEC standards. All Energypac busbar is manufactured and inspected in an ISO 9001 registered facility.

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Straight lengths

Used for distributing power and for supplying high powered loads.
Feeder and plug-in sections are interchangeable. On both sides of the sections the position of the phases as well as of the neutral are marked.
The plug-in version allows for a total of up to 3 tap-off outlets on a three meters section depending on rated current.
Straight lengths with outlets are ideal for achieving rising mains or sections with high density of tap-off points.
The EX range is totally painted which offers resistance to chemical agents, improves resistance to galvanised sheet metal corrosion and gives better heat dissipation.
The conductors are packed against each other (sandwiched) so as to minimise the distance between one phase and the other, thus achieving the advantage of minimizing the mutual reactance, hence the impedance of the busbar.

Elbow

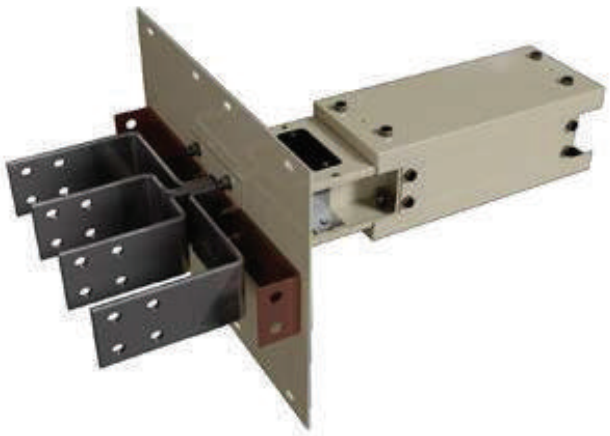
Elbows allow the busbar trunking system to change directions routes both horizontally and vertically. Elbows are 90° as standard. They have the same quick joint connection as the straight lengths. The protection degree is IP55.

End feed units

These enable the EX range to be supplied by cable or directly connected to an electric distribution panel; the assembly of the line is carried out with a quick monobloc connection as with the straight lengths. The end feed units are provided with LV connections for the connection of conductor link or cables equipped with hole.

End feed unit box

End feed unit box ensure protection of electrical cable connect ion to the busway distribution system. End Feed unit box can be installed at the end or beginning of a run. Vertical end feed unit boxes and horizontal end Feed unit box can be installed in both horizontal and vertical applications. Extended end Feed unit box are available if the application requires additional wire bending space.
A end Feed unit box includes a gasketed and accessible termination box, lugs, necessary insulation tape .



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Tap-off boxes

Tap-off box distributes power from busbar trunking. Tap-off box is provided with MCB or MCCB of different current ratings from three-phase loads from 25A up to 1000A: they can be divided into two main categories:

a) Plug-in tap-off boxes (from 63A up to 400A): they can be operated when energized but not when under load conditions. When the tap-off box is installed on the busbar, the opening of the cover electrically disconnects its internal parts, in other words no accessible metallic part is live when the cover is open. All TECHNO plugin type boxes have a PE contact (protective conductor), which is the first to make an electrical connection when the box is plugged into the outlet, and the last to disconnect when the tap-off is unplugged.

b) Boxes bolted on the junction (from 125A to 1250A): these high rated current boxes are rigidly connected to the busbar with a special "monobloc" connection system similar to that of the straight lengths but this also allows for power to be tapped-off from the busbar. The boxes can only be installed and removed when the system is de-energized (isolated busbar).

All insulating plastic components of tap-off box comply with the incandescent wire test (EN 606952-1) and have a V1 selfextinguishing degree (UL94); the standard degree of protection is IP55 without using additional IP protection kits. If the boxes are equipped with a switch, the rotary handle extension is carried out with a handle on the cover of the box which makes it possible to open the switch before removing the box from the busbar.

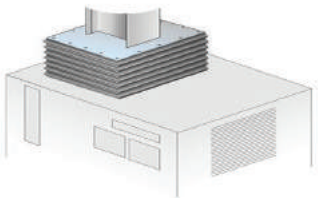
Additional elements

Depending on the different installation requirements, Energypac offer different technical solutions:

Fire barrier
When the busbar trunking system crosses fire resistant walls or ceilings, it must be fitted with appropriate fire barriers. The Energypac fire barrier meets class S 120 (according to DIN 4102 part 9), and may be installed on any trunking component (straight or elbow element) In order to ensure the maximum resistance class, for some ratings it is also necessary to fit at the factory an internal fire barrier. It is therefore necessary to indicate at the order stage what elements will cross fire resistant walls or ceilings. The fire barrier is 700 mm 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.

Flexible braids:
In order to ensure safer connection between transformer and busbar trunking unit, flexible braids is a smart solution. Energypac provides braids type flexible copper which has better vibration damping power than foil type .It reduces temperature rise in junction point and can compensate thermal expansion, if occurs. Depending on rating of busbar, overall dimension of flexible braids changes.

Protection bellows:
Due to high vibration of generator, manufacturers often face difficulties to connect busbar with Generator. To solve the problem, Energypac introduces this protection bellow which is made of special coated fabric with rigid PVC support in every fold.



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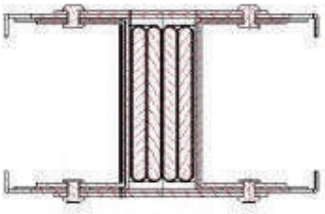
TECHNICAL DATA
EXA AL



Technical Data										
Rated current	400	630	800	1000	1250	1600	2000	2500	3200	4000
Casing Material										
Dimension lateral casing	85	85	85	100	130	200	220	267	407	44 7
Height of the bar	50	60	75	90	120	190	210	120	190	210
Overall dimensions	140 ×85	140 ×85	140 ×85	140 ×100	140 ×130	140 ×200	140 ×220	140 ×267	140 ×407	140 ×447
Phase and neutral cross section	300	360	450	540	720	1140	1260	1440	2280	2520
Pe cross section (mmq Fe)	1103	1103	1103	1148	1229	1439	1499	1646	2100	2340
Operating/insulation voltage	100 0									
Phase resistance @ 20° C (mohm/m)	0,107	0,089	0,071	0,059	0,044	0,028	0,025	0,022	0,014	0,013
Phase resistance @ 50 % load C (mohm/m)	0,109	0,091	0,074	0,062	0,046	0,027	0,027	0,023	0,015	0,014
Phase resistance @ thermal conditions (mohm/m)	0,117	0,098	0,081	0,069	0,052	0,030	0,032	0,027	0,018	0,016
Phase reactance (mohm/m)	0,026	0,021	0,017	0,016	0,015	0,014	0,010	0,006	0,005	0,005
Impedance @ 20° C (mohm/m)	0,110	0,091	0,073	0,061	0,047	0,031	0,027	0,023	0,015	0,014
Impedance @ 50 % load	0,112	0,093	0,075	0,064	0,049	0,030	0,029	0,024	0,016	0,015
Impedence @ thermal conditions (mohm/m)	0,120	0,100	0,083	0,070	0,054	0,033	0,034	0,028	0,018	0,017
Resistance of protective conductor (mohm/m)	0,118	0,118	0,118	0,113	0,106	0,090	0,087	0,079	0,062	0,056
Rated short-time current for three-phase fault (1 s) - KA	30	35	40	50	55	60	80	100	100	120
Rated short-time current for phase-neutral fault (1 s) - KA	30	35	40	50	55	60	80	100	100	120
Rated short-time current for phase-Pe fault (1 s) - KA	18	21	24	30	33	36	48	60	60	72
Allowable peak current for three-phase fault (kA)	66	77	88	110	121	132	176	220	220	264
Allowable peak current for phase-N fault (kA	66	77	88	110	121	132	176	220	220	264
Allowable peak current for phase-Pe fault (kA)	40	46	53	66	73	79	106	132	132	158

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Allowable specific energy (A^2s)*10 ^{6} for three-phase fault	900	1225	1600	2500	3025	3600	6400	10000	10000	14400
Allowable specific energy (A^2s)*10 ^{6} for single-phase fault	900	1225	1600	2500	3025	3600	6400	10000	10000	14400
Resistance @ fault loop (mohm/m)	0,22	0,21	0,19	0,17	0,15	0,12	0,11	0,10	0,08	0,07
Reactance @ fault loop (mohm/m)	0,10	0,10	0,10	0,10	0,06	0,05	0,04	0,03	0,02	0,02
Impedance @ fault loop (mohm/m)	0,25	0,23	0,21	0,20	0,16	0,13	0,12	0,11	0,08	0,07
Joule losses at rated current (W/m)	224,8	187,3	155,2	205,5	244,9	233,1	388,0	506,0	540,5	784,4
Weight (kg/m)	18,5	19,0	19,7	19,9	20,5	24,9	29,4	41,0	49,2	53,0
Degree of protecion	IP 55									

Voltage drop calculation @ rated current and distributed load (V/m/A *10 $^{-6}$)	K parameter									
cos φ										
0,70	87,0	72,1	59,5	51,4	40,9	27,1	25,8	20,1	13,8	13,0
0,75	90,9	75,4	62,2	53,7	42,5	27,7	26,7	21,0	14,3	13,5
0,80	94,6	78,5	64,8	55,8	44,0	28,3	27,6	21,8	14,8	13,9
0,85	98,0	81,4	67,2	57,7	45,3	28,7	28,4	22,6	15,2	14,3
0,90	101,1	84,0	69,4	59,4	46,4	28,9	29,0	23,3	15,6	14,6
0,95	103,3	85,9	71,1	60,7	47,0	28,8	29,3	23,8	15,8	14,8
1,00	101,4	84,5	70,0	59,3	45,2	26,3	28,0	23,4	15,2	14,2

Voltage drop calculation

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

Where:

b = 1	for distributed load
b = 2	for load at the end of the line
K	k parameter
L	length of the line
Ib	current of the line
Vn	rated voltage of the line

Data for Cable
Isc(t) = Isc(1)/sqrt(t)
Isc(t) = Short circuit current for any duration (less than 5sec [Unit:A]
Isc(1) = Short circuit current at 1 sec (catalog or Icw) [Unit:A]
t= short circuit duration for specific system (sec)

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