Busbar system

unibar H 800 A to 4000 A

System manual

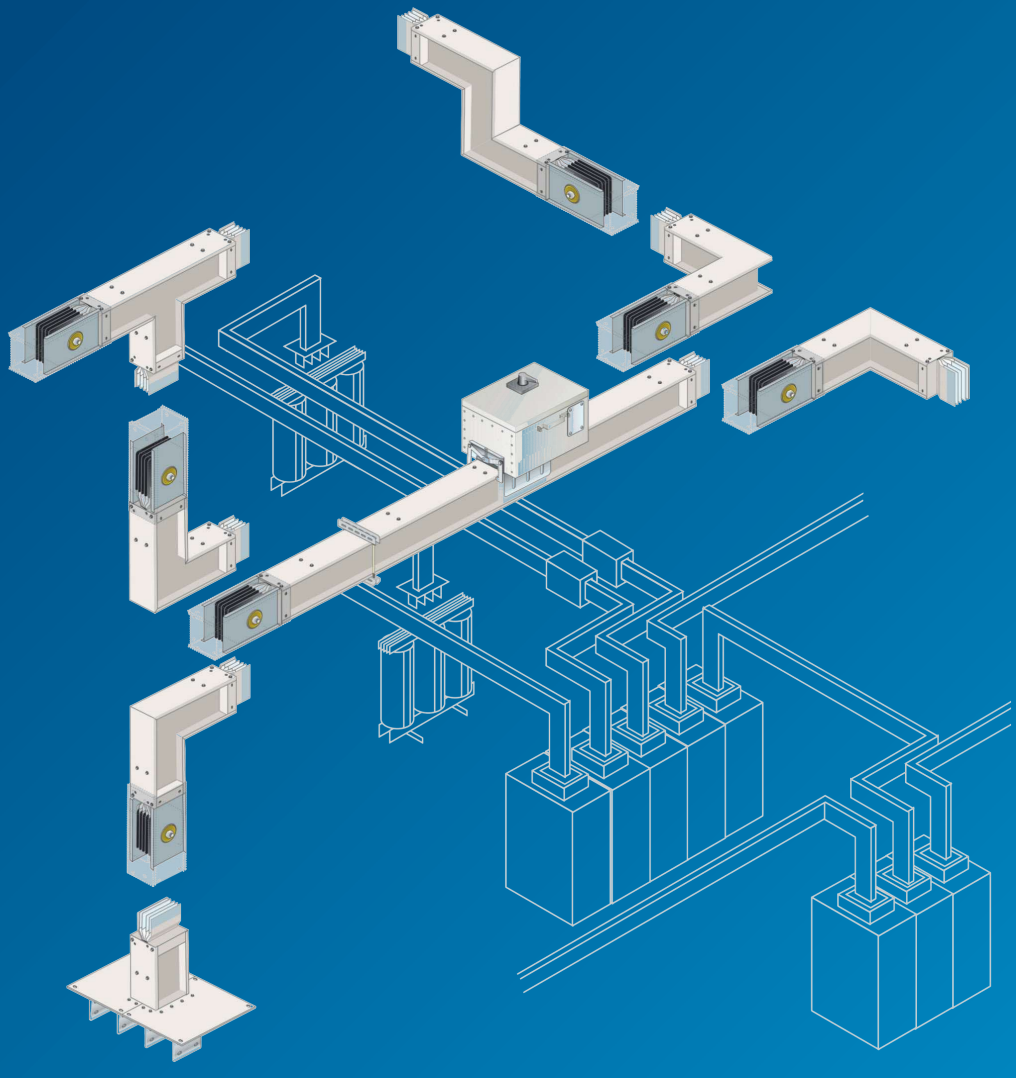

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Table of contents

1 About this manual 5
1.1 Warranty and Liability 5
1.2 Copyright 5
1.3 Revision index 5

2 Why a busbar system? 6

3 Construction and characteristics 8
3.1 Characteristics of the busbar system 8
3.2 System components: Overview 9
3.3 Busbar elements: Design 11
3.3.1 Double body system (from 2500 A) 12
3.3.2 Dimensions according to rated current 12
3.4 Busbar elements: Features 13
3.4.1 Connection joint with joint block 13
3.4.2 Straight length busbar elements 15
3.4.3 Changes of direction 15
3.4.4 Feeder units 16
3.5 Tap-off units for plug-in (125 - 630 A) 17
3.6 Tap-off units for connection joints (250 - 1250 A) 18

4 Product selection 20
4.1 Type key for busbar elements 20
4.2 Straight busbar elements 22
4.2.1 Straight busbar elements without plug-in 22
4.2.2 Straight busbar elements with plug-in 24
4.2.3 Fire Barrier 25
4.2.4 Expansion compensation unit 26
4.3 Change Directions 27
4.3.1 Elbow, horizontal 27
4.3.2 Knee, vertical 28
4.3.3 Double horizontal change direction (Z-element) 29
4.3.4 Double vertical change direction (Z-element) 30
4.3.5 Offset change direction (offset elbow/knee) 31
4.4 T-elements 32
4.4.1 T-element, horizontal 32
4.4.2 T-element, vertical 33
4.5 Connection elements 34
4.5.1 Transformer connection element 34
4.5.2 Terminal elements 35

4.6 Drill holes for connecting flanges 38
4.6.1 Standard type 38
4.6.2 Other types 39
4.7 Cable feeder 41
4.7.1 Cable end feeder 41
4.7.2 Cable intermediate feeder 41
4.8 Tap-off units 42
4.8.1 Type key for tap-off units 42
4.8.2 Tap-off units for plug-in 43
4.8.3 Tap-off units for connection joints 45
4.9 Accessories 46
4.9.1 End flange 46
4.9.2 Fastening material 46
4.9.3 Joint block, standard (spare part) 47
4.9.4 Joint block for tap-off units 47

5 Sketches of busbar elements 48

6 Technical data 52
6.1 Conductors aluminium, 4 bars (N, L1, L2, L3), PE housing 52
6.2 Conductors aluminium, 5 bars (N, L1, L2, L3, PE2), PE housing 53
6.3 Conductors copper, 4 bars (N, L1, L2, L3), PE housing 54
6.4 Conductors copper, 5 bars (N, L1, L2, L3, PE2), PE housing 55
6.5 Conductors aluminium, 4 bars (N, L1, L2, L3), aluminium housing 56
6.6 Conductors aluminium, 5 bars (N, L1, L2, L3, PE2), aluminium housing 57
6.7 Conductors copper, 4 bars (N, L1, L2, L3, PE), aluminium housing 58
6.8 Conductors copper, 5 bars, (N, L1, L2, L3; PE2), aluminium housing 59
6.9 Calculating the voltage drop 60
6.10 Temperature derating 61
6.11 EMC values 61
6.12 Sprinkler test 62
6.13 Functional endurance 63
6.14 Connecting to unimes H energy distributor 65

7 Installation, handling and maintenance 67
7.1 For your safety 67
7.1.1 Intended use 67
7.1.2 Requirements for authorised personnel 69
7.1.3 Observe the assembly instructions 70
7.2 Transport and storage 71
7.2.1 Lifting busbar elements 71
7.2.2 Storage 72
7.3 Assembling the unibar H system 73
7.3.1 Hangers 73
7.3.2 Mounting direction and installation position 74
7.3.3 Assembly principle for connection joints with protection type IP55/IP65 76

7.3.4 Assembly principle for connection joints with protection type IP68 78
7.3.5 Cable feeds 80
7.3.6 Fire barrier 81
7.3.7 End flange 82
7.3.8 Fitting tap-off units to plug-in (125 - 630 A) 83
7.3.9 Fitting tap-off units to connection joints (250 - 1250 A) 85
7.4 Operation, maintenance and enlargement 86
7.4.1 Maintenance 86
7.4.2 Enlargement 87

8 Comments for specifications for tenders 88

9 Formula characters and abbreviations in accordance with EN 61439-1/-6 90

10 Glossary 91

11 Index 95

1 About this manual

This document is intended for planners, operators and users of the unibar H busbar system. The system manual provides information about the efficient use of the busbar system and also provides information

- on planning and dimensioning,
- of a general nature on handling and operation.

Related documents

- Follow the assembly instructions for the unibar H busbar system. The assembly instructions provide detailed information on
  - safe transport of the busbar elements,
  - safe assembly and installation,
  - safe operation,
  - safe maintenance,
  - the expansion of installed unibar H busbar trunking systems.

1.1 Warranty and Liability

These instructions do not extend the Sales and Delivery Conditions of Hager. No new claims concerning the warranty and guarantee, which extend beyond the Sales and Delivery Conditions, can be derived from this manual.

Liability note

Hager reserves the right to modify or supplement the product or the documentation at any time without prior notice. Hager assumes no liability for typographical errors and any damage which may arise from them.

1.2 Copyright

1.3 Revision index

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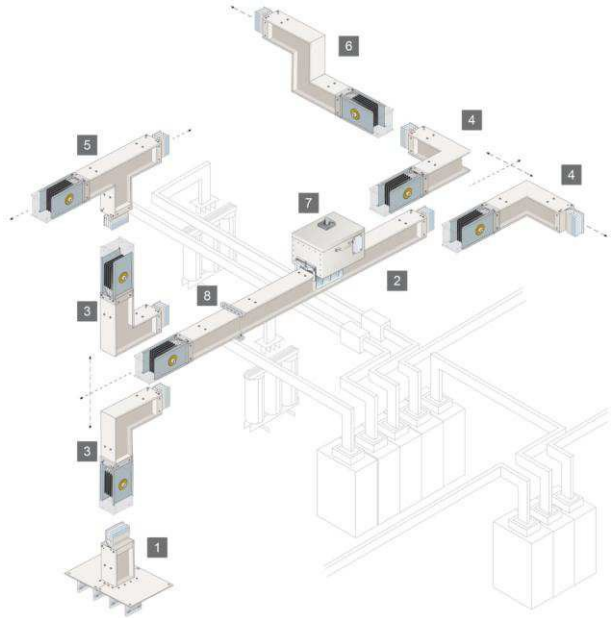
2 Why a busbar system?

Energy distribution must not only be flexible and low priced, but also space-saving, safe and with a long service life. unibar H busbar systems from Hager are just that: efficient and reliable. With this system energy can be transported and distributed precisely: from the transformer to the low voltage switchgear and through the entire building.

Space-saving

As a result of its compact construction, the busbar system is very space-saving. Particularly with changes of direction, there are no bend radii of any kind or similar to be observed.



Safe

Safety for persons and buildings is ensured by tested short circuit values of up to 253 kA (I_{pk}) and very low fire loads. In particular, the tested firewalls are reliable and safe.

Cable laying (left) versus unibar H (right)
- low space requirement of busbars
- neat, safe installation with tested firewalls with unibar H

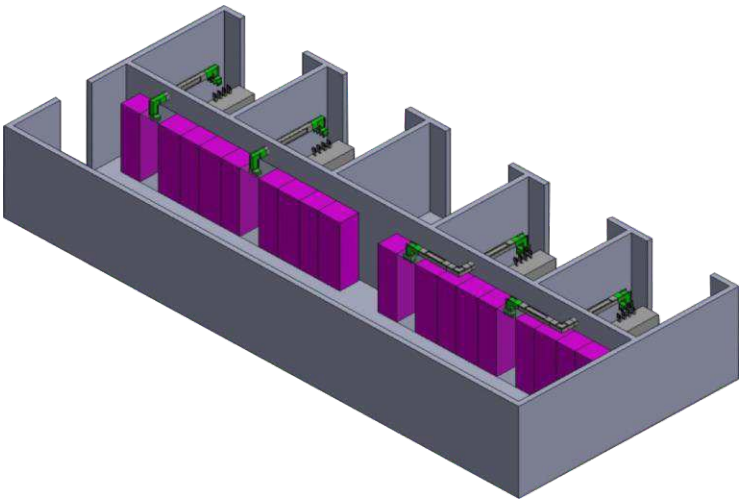
The busbars conform to EN 61439-1 and EN61439-6.

Long, maintenance-free working life

With an average lifetime of over 25 years for an installed busbar, the investment is well protected. Furthermore, the installed busbar trunking system is maintenance-free. The clamping bolts at the connection joints can be checked at a later time without having to disconnect the busbar run (Protection Type IP55 / IP65).

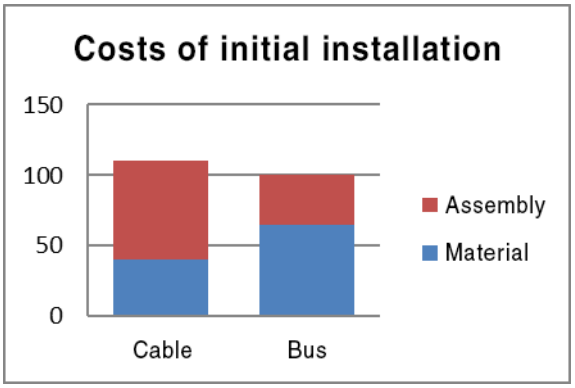
Flexible

We comply with the customer's specifications when creating the routing plan for the busbar system. The route is adapted to local circumstances and can be modified at any time. Modifications and expansions with unibar components are possible at any time after the installation of the busbar trunking system. In this way, all the requirements for the strand course can be met. Tap-off units up to 630 A can be plugged into the plug-in of straight busbar elements, even when there is current on the busbar run.

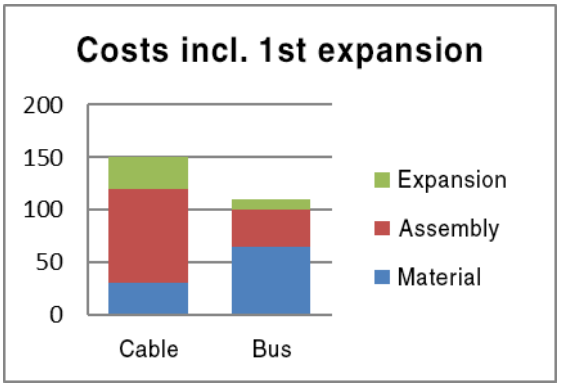


Cost-effective

When considering costs, attention must be paid not only to the purchase price of the material, but also to the assembly costs. An expansion will also contribute considerably to the overall costs. The following graphics illustrate potential cost savings from using busbars in contrast to laying cables. Incidentally, the graphics do not take account of the additional savings due to the lower space requirements of busbars:



Example of cost comparison for initial installation: due to the lower assembly costs, savings are possible when busbars are used



Example of cost comparison including 1st Expansion: with the expansion, busbars offer the possibility of significantly lower overall costs

3 Construction and characteristics

3.1 Characteristics of the busbar system

- Compliance with the IEC 61439-1 and 61439-6 international standards, as well as all European and national standards derived from them; CE-marking.
- Voltages up to 1000 V, frequency 50/60 Hz
- Protection type IP55 / IP65 or IP68 (cast resin system, only for energy transport), also feasible combined within one busbar run
- The inner conductor of the busbar elements is made either from a tinned aluminium alloy or from 99.9% pure ETP-copper conforming to EN 13601
- Housing made from 1.5 mm galvanised steel or an aluminium housing, painted in RAL 7035 (special colours possible)
- Housing is used as PE protective conductor
- Heat is dissipated by the surface of the housing. The temperature rise of the housing remains below 55 ° even at the rated current, irrespective of the installation position and orientation
- Ambient temperature: min. -5 °C, max. 35 °C, 24-hour average 35 °C
- System components are free of silicones and halogens

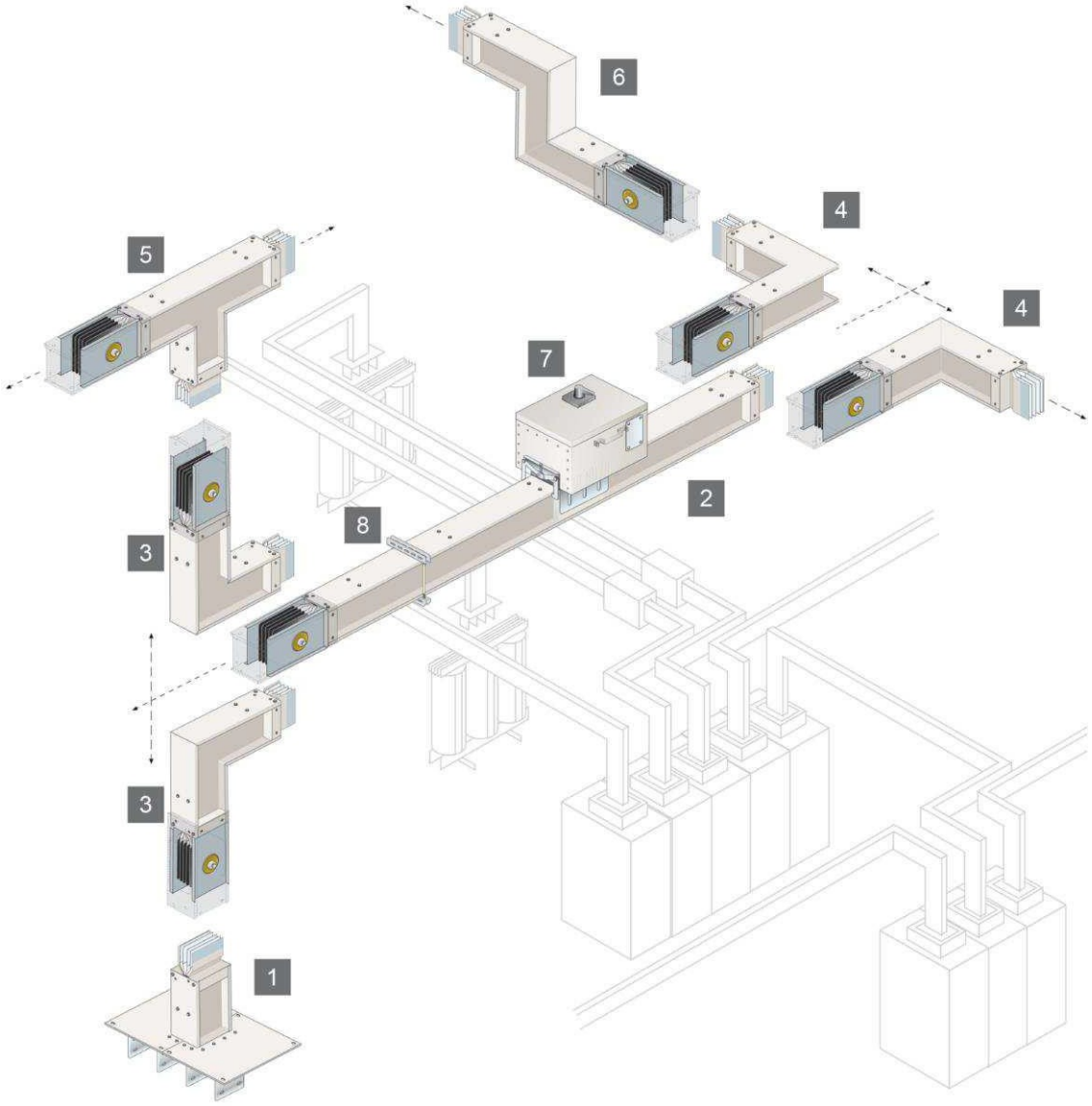
Flexibility and expandability

- Horizontal and vertical mounting is possible, with no reduction in nominal capability (with N conductor in bottom position for horizontal mounting and flat installation position)
- Busbar elements available in various geometric shapes for changing direction
- Straight busbar elements available with or without plug-in in lengths up to 3 m
- Straight busbar elements available in selectable lengths 410 - 3000 mm
- Individual busbar elements can be removed without having to remove the adjacent busbar elements (protection type IP55 / IP65).
- The joint block in the connection joints of the busbar elements enables efficient assembly and later checking or tightening of the torque (protection type IP55 / IP65).
  - State-of-the-art single bolt clamps with torque indicated by the shear-off bolt.
  - Torque with the joint block in the connection joints of the busbar elements: approx. 60 Nm
- Feeder units for transformers, terminals and cable feeders

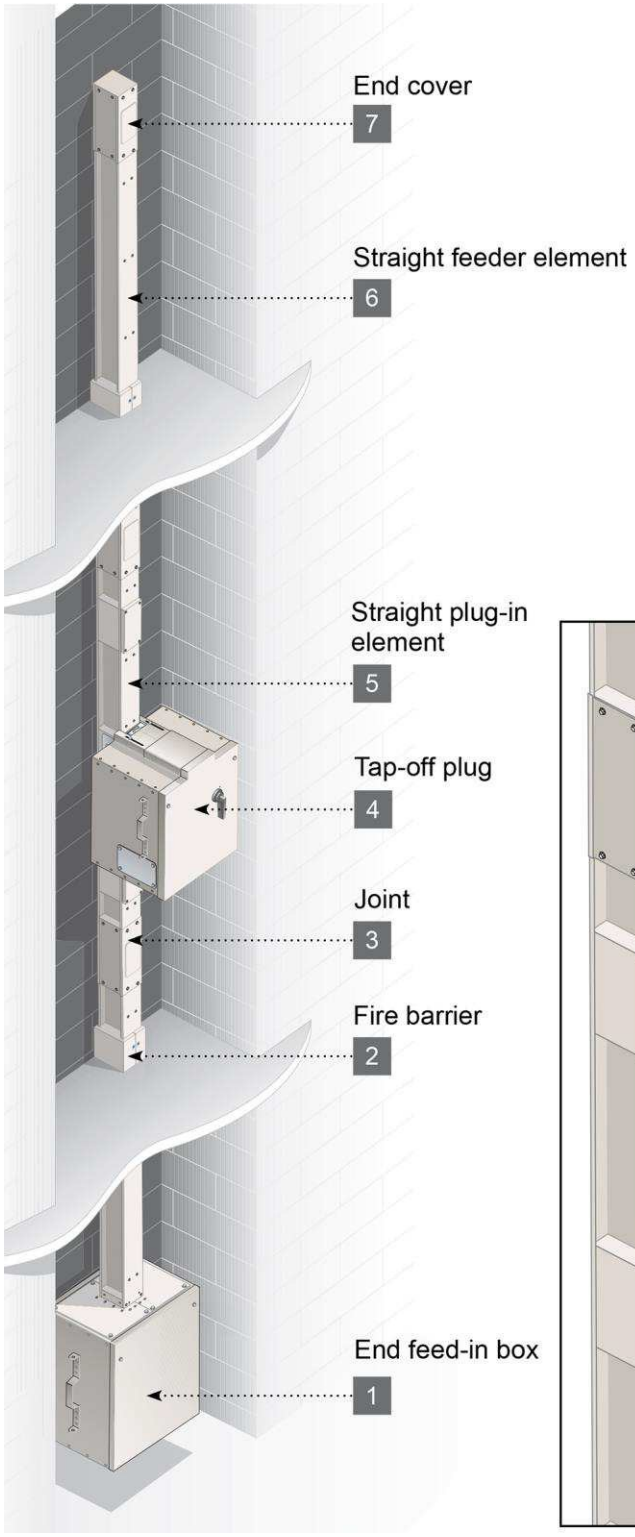
Tap-off units for plug-in or connection joints

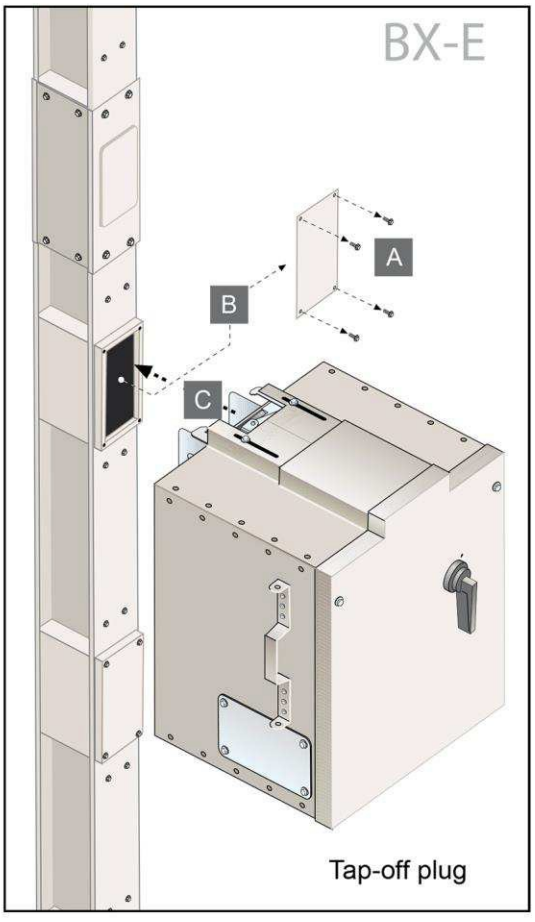
- Tap-off units can also be installed later by electrical specialists
- Tap-off units available with HRC fused switch disconnector, or with circuit breakers (MCCB)
- Tap-off units up to 630 A for plug-in on straight busbar elements can be fitted while voltage is applied (taking account of EN 50110 and national regulations)
- Tap-off units 250 A - 1250 A available for connection joints with a special joint block

3.2 System components: Overview

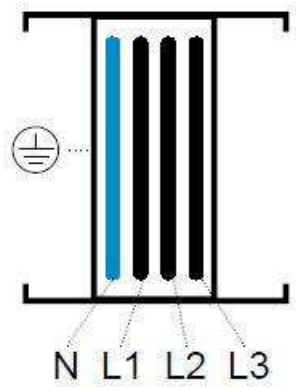


1	Terminal connection
2	Straight length, with or without plug-in
3	Bracket, vertical (knee)
4	Bracket, horizontal
5	T-pieces (T-boxes)
6	Double bracket, vertical / Z-knee (Z-box)
7	Tap-off unit (symbolic representation) - for plug-in (125 - 630 A, can be plugged in when voltage is applied on busbar run) - for connection joints (250 - 1250 A)
8	Fastening material (symbolic representation)


End cover
7
Straight feeder element
6
Straight plug-in element
5
Tap-off plug
4
Joint
3
Fire barrier
2
End feed-in box
1

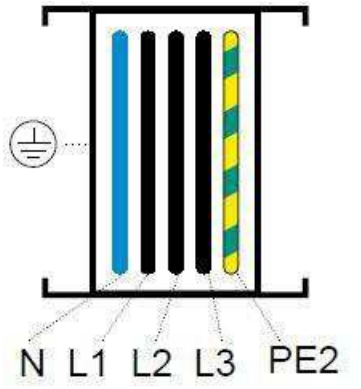

BX-E
A
B
C
Tap-off plug

3.3 Busbar elements: Design



For standard applications with 4 inner bars: the neutral conductor N has the same cross-section as L1/L2/L3.

The protective earth PE corresponds to the housing.



If a larger cross-section is demanded for the PE, an additional inner bar (PE2) is inserted. All internal conductors (N, L1, L2, L3 and PE2) have the same cross-section.

The internal conductors consist of either aluminium or copper and are insulated over their entire length. The insulation coating consists of an F-class polyester tape.

- Aluminium conductors are coated over their entire length with zinc, copper and tin.
- Copper conductors consist of 99.9% pure ETP copper conforming to EN 13601.

3.3.1 Double body system (from 2500 A)

Busbar elements with high rated currents I_n for 2500 A / 3200 A / 4000 A consist of two parallel conductor bundles (Double body system, doubled conductor system) In this case the conductors are installed together in two packs in one housing.

- Aluminium conductors: Double body system for rated current I_n of 2500 A, 3200 A and 4000 A
- Copper conductors: Double body system for rated current I_n of 3200 A and 4000 A

The different conductors for the same phase are connected in parallel at each connection joint (at least every 3 m for standard elements). Conductors for the same phase thus undergo phase balancing at each connection joint to ensure uniform current distribution. Special elements for phase compensation are not necessary.

Installation efficiency, balanced load distribution

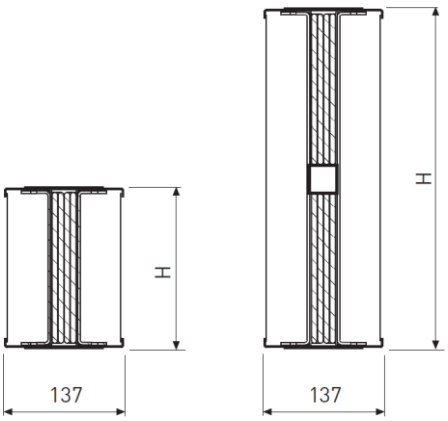
The solution with two parallel conductor packs in one housing has two major advantages compared with other systems:

- Quick, simple installation (phases need only be combined once)
- Load distribution is balanced

3.3.2 Dimensions according to rated current

Rated current I_n	H for Al	H for Cu
800 A	85 mm	
1000 A	95 mm	85 mm
1250 A	121 mm	85 mm
1600 A	160 mm	121 mm
2000 A	205 mm	150 mm
2500 A	286 mm D	185 mm
3200 A	376 mm D	248 mm D
4000 A	416 mm D	306 mm D

D = Double body system, doubled conductor system



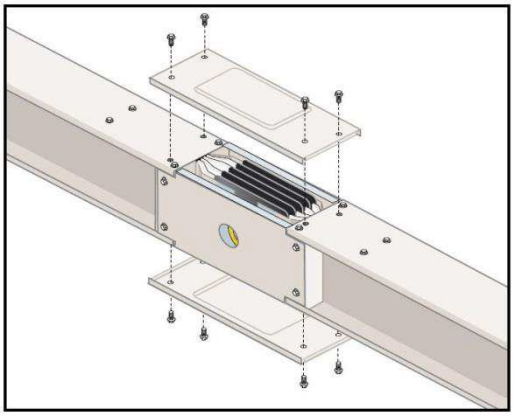
3.4 Busbar elements: Features

- 4-pole (N, L1, L2, L3) and 5-pole (N, L1, L2, L3, PE2) available, each with PE housing
- Neutral conductor has same cross-section as the phases (L1, L2, L3 conductors)
- System elements available as single conductor or double conductor (double body system) according to rated current
- Protection type for standard housing: IP55
- Phases labelled at both ends of the busbar element
- Insulation materials are temperature resistant up to 155 °C
- Dielectric proof voltage of 3500 V

3.4.1 Connection joint with joint block

The connection joint between adjacent busbar elements is implemented with a joint block. The joint block consists of

- the supplied joint block (with shear-off bolt),
- the supplied flanges for covering, for connecting the PE housings and for additional mechanical stabilisation.



Connection joint with joint block for protection type IP55

- Joint block for electrical and mechanical connection of the inner conductors of adjacent busbar elements
- Side flanges and screws
- Torque on clamp can be checked at a later time; disconnection of busbar run is not necessary for this
- Joint block can be changed at any time (for a tap-off unit or other conversions / expansions)

The connection joint with a joint block between unibar H busbar elements ensures the following in a work process:

- the electrical and mechanical connection of all inner conductors in the busbar, including the PE conductor
- with double body systems (doubled conductor systems), additionally the parallel switching and phase balancing of the busbars

The interior of the joint block consists of silver-plated copper plates which have been alternately layered with insulating material plates. The insulating material is temperature-resistant up to 200 °C.

Single bolt clamp(s)

The joint block is fitted with single bolt clamp(s) to clamp and connect the conductors of adjacent busbar elements. The joint block is provided with 1, 2, or 4 bolt clamps, depending on the rated current and number of internal conductors in the busbars.

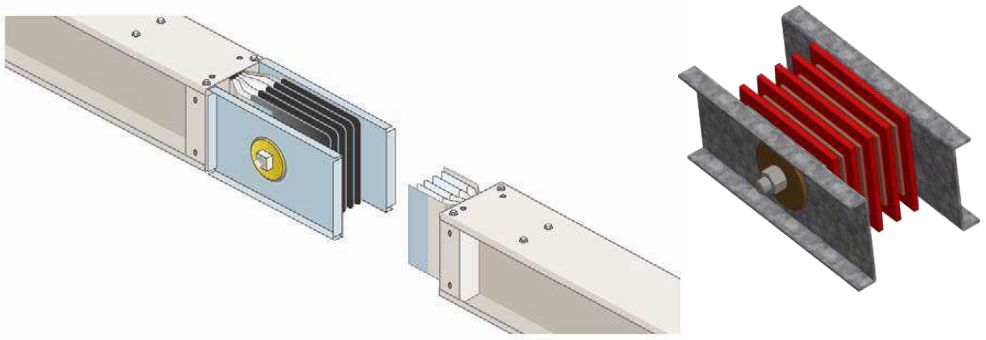


Illustration of principle of joint block with single bolt clamp: efficient assembly, subsequent replacement possible (for protection type IP 55/65)

Efficient assembly with indication of torque

- The conductor rails of the adjacent busbar elements are fed from both sides into the clamping block until the conductors are uniformly aligned.
- The single bolt clamp(s) on the joint block is then tightened with a torque wrench until the double-headed bolt (on the outer part of the shear bolt) shears off. This occurs at a torque of approx. 60 Nm.

Subsequent checking of the clamp while current is on the busbar run is possible

- The joint block in the connection joints of the busbar elements enables efficient assembly. On connection joints with protection type IP55 / IP65, the cap-sealed flange opening allows subsequent checking or tightening of the torque.
- The torque on the joint block can be checked without having to disconnect the busbar run.

With IP55 / IP65, the connecting block can be changed at a later date

- With a protection type IP55 / IP65 connection joint, the joint block can be changed at a later date.
- Using accessories, it is possible in protection types IP55 and IP65 to use a tap-off unit for connection joints (250 - 1250 A) at each connection joint between straight busbar elements.
- Using accessories, it is possible in protection types IP55 and IP65 to implement a cable intermediate feeder or other conversions/enlargements at each connection joint between straight busbar elements.

Connection joints for protection type IP68

Connection joints in busbar elements with protection type IP68 (cast resin system) are formed with essentially the similar joint block as for protection type IP55.

- The torque for the clamping block in the connection joints for adjacent busbar elements is approx. 60 Nm, at which point the outer part of the shear-off bolt shears off.

The flanges are fitted with seals and for protection type IP68 provide openings for filling the cast resin mixture.

- Later checking of the tightening torque of the single bolt clamp(s) (the clamp) is not planned for here.
- Busbars with protection type IP68 are intended exclusively for energy transport.

3.4.2 Straight length busbar elements

- Available with plug-in (IP 55) or
  without plug-in (IP55 / IP65 or IP68 (cast resin system))
- Available without plug-in in standard lengths 1 m, 2 m , 3 m
- Available without plug-in in selectable lengths 410 to 3000 m

- With plug-in: Straight length busbar elements of protection type IP55 can support up to 6 plug-in on each 3 m length (depending on the rated current, see chapter "Product selection")
  - Plug-in on one side (3 plug-in)
  - Plug-in on both sides, offset (4 plug-in, 2 plug-in each on each 137-mm side)
  - Plug-in on both sides (6 plug-in, 3 plug-in each on each 137-mm side)

3.4.3 Changes of direction

Changes of direction are implemented with standardized system components.

Standardized system components are available with various rated currents (see chapter "Product selection"):

- Elbows/knees: Horizontal elbows, vertical knees, Z-elements horizontal, Z-elements vertical, offset elbows/knees
- T-elements(T-boxes): Horizontal T-elements, vertical T-elements
- Variants with different positions of the phases / N conductor

Flexible changes of direction and changes of direction implemented as cable connections are not permissible.

3.4.4 Feeder units

- Standardized feed options for transformers, terminals and cable feeder are available
- Terminal elements for different rated current, direction and conductor configurations
- Type-tested terminal elements to Hager unimes H energy distribution system (connection up to 4000 A)

Connection of unibar H to unimes H

Cable intermediate feeder

Cable intermediate feeder for connection joint between two adjacent straight busbar elements.

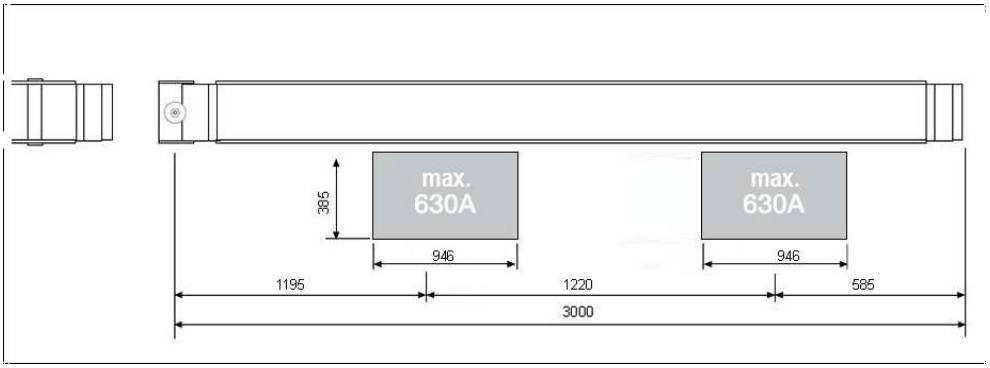
- The cable intermediate feeder is used to feed busbar elements from a connection joint.
- The two busbar elements are fed simultaneously via the cable intermediate feeder. Independent supply of one side is not possible.
- Cable intermediate feeder can be used to reduce the voltage drop over long busbar runs.
- The maximum current carried is 2000 A for aluminium- and 2500 A for copper inner conductors in the busbars.

3.5 Tap-off units for plug-in (125 - 630 A)

- Tap-off units for plug-in are available for straight busbar elements with plug-in in protection type IP55. They can be used on straight busbar elements with plug-in of any rated current.
- Tap-off units for plug-in with currents up to 630 A can be installed while operating (without disconnecting the busbar run). However, country-specific regulations may prohibit connecting to live busbar runs.
- Tap-off units for plug-in are constructed to fit only one way.
- They are fitted with an interlock which prevents the units from being plugged into or being removed from the straight busbar elements while the protection device is switched on.

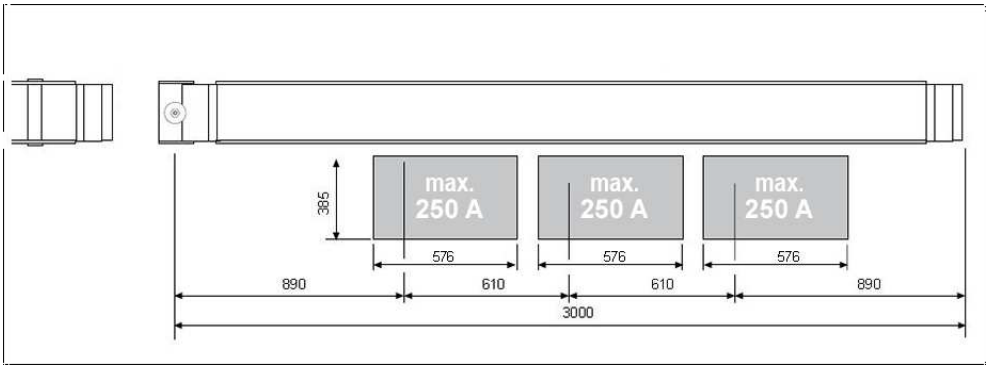
Connection compartment for tap-off units

Planning information: Tap-off units for 400 and 630 A plug-in have an extra large connection compartment. Consequently they can only be fitted to straight busbar elements with up to 2 plug-in per side.



Dimensions of straight busbar element with 2 plug-in per side

On straight busbar elements with three plug-in on one side, when fully extended only tap-off units up to a maximum rated current of 250 A are possible.



Dimensions of straight busbar element with 3 tap-off units per side

Tap-off units with fused switch disconnector, or MCCB

- Tap-off units for plug-in are equipped with circuit breakers (MCCB) or HRC fused switch disconnector.
- Empty tap-off units for self-configuration are also available.

Tap-off units with HRC fused switch disconnectors are available for the following fuses (delivery always without fuses):

HRC fuse	Rated current of tap-off unit
Size 00	125 A
Size 1	250 A
Size 2	400 A
Size 3	630 A

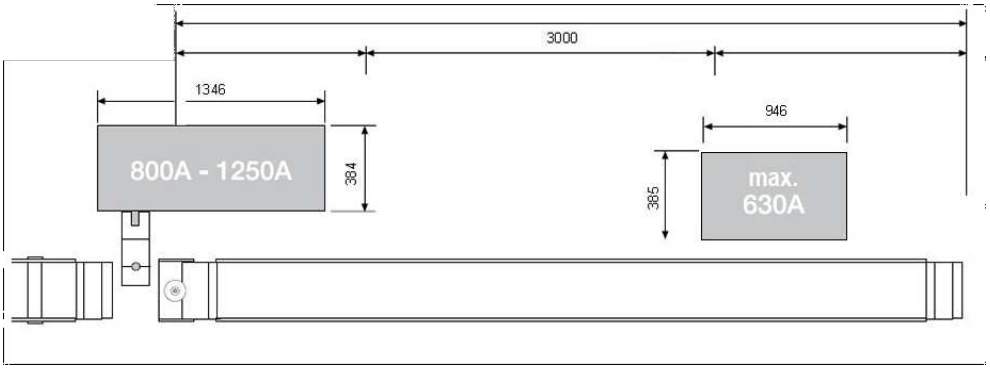
3.6 Tap-off units for connection joints (250 - 1250 A)

Tap-off units for connection joints are available for connection joints on straight busbar elements with protection type IP55. They can be used at connection joints on straight busbar elements of any rated current.

- Installing a tap-off unit requires the power to be disconnected from the busbar run.
- A joint block for tap-off units (with a special joint block), available as an accessory, is installed.
- Tap-off units for plug-in are equipped with circuit breakers (MCCB) or HRC fused switch disconnectors.

Connection compartment for tap-off units

Planning information: Because of the dimensions, the installation of a tap-off unit for connection joint may restrict the fitting of tap-off units on neighboring straight busbar elements with plug-in (for version of straight busbar elements with plug-in offset on both sides).



Dimensions of tap-off unit for connection joints (on left in picture)

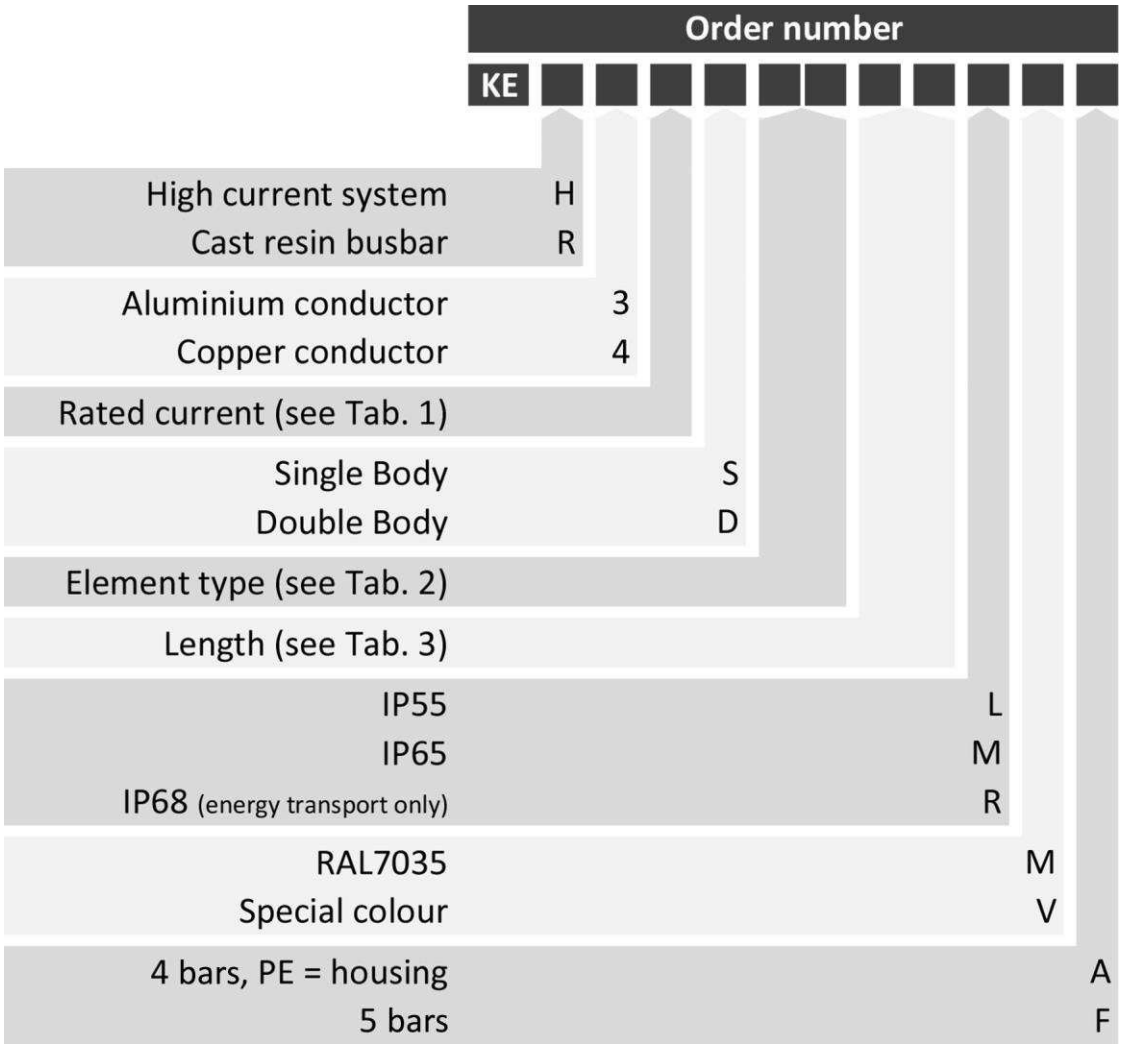
Notices

4 Product selection

The order numbers for aluminium conductor material, 4 inner rails (N, L1, L2, L3), PE housing (steel) are always given.

Variant order numbers will arise from the type key.

4.1 Type key for busbar elements



Examples:

- 4 bars, straight length, 800 A, 2 m, aluminium conductors, IP55, RAL7035: KEH33S80LMA
- 4 bars, straight length, 1600 A, 2 m, aluminium conductors, IP55, RAL7035: KEH36S80LMA

For further types please ask your hager partner.

Tab. 1 Rated current

I_n [A]	Al	Cu
800	3	./.
1000	4	3
1250	5	4
1600	6	5
2000	7	6
2500	1	7
3200	2	1
4000	3	2

Double body

Tab. 2 Element type

Element type	Ref. No.	Code
Straight length up to 3m		00
Straight length up to 2m		80
Straight length up to 1m		81
Straight length with plug-in*		09
Straight length with plug-in*		99
Horizontal elbow, N inside	424004	04
Horizontal elbow, N outside	424005	01
Knee, vertical		02
Z-element horizontal		21
Z-element vertical, N on left	424008	22
Z-element vertical, N on right	424009	23
Offset change direction	424010	16
Offset change direction	424011	15
Offset change direction	424012	14
Offset change direction	424013	13
T-element, horizontal, N on right	424034	08
T-element, horizontal, N on left	424035	07
T-element, vertical	424033	06
Terminal connection, standard		03
Terminal connection with knee, N on outside	424017	11
Terminal connection with knee, N on inside	424018	31
Terminal connection with knee	424019	32
Terminal connection with knee	424020	12
Terminal connection without joint block		93
Transformer connection without joint block		82
Transformer connection with joint block		83
Fire Barrier		19
Special part		77
Standard joint block		29
Joint block for tap-off units		79
Plug-in for tap-off units		78
End flange		10
Fastening material		20
Cable end feeder, N on left	424014	51
Cable end feeder, N on right	424015	52
Cable intermediate feeder		53
Expansion compensation unit		88

xxxx*depends on maximum current

Sketches for Ref. No. 424xxx see chapter "Sketches"

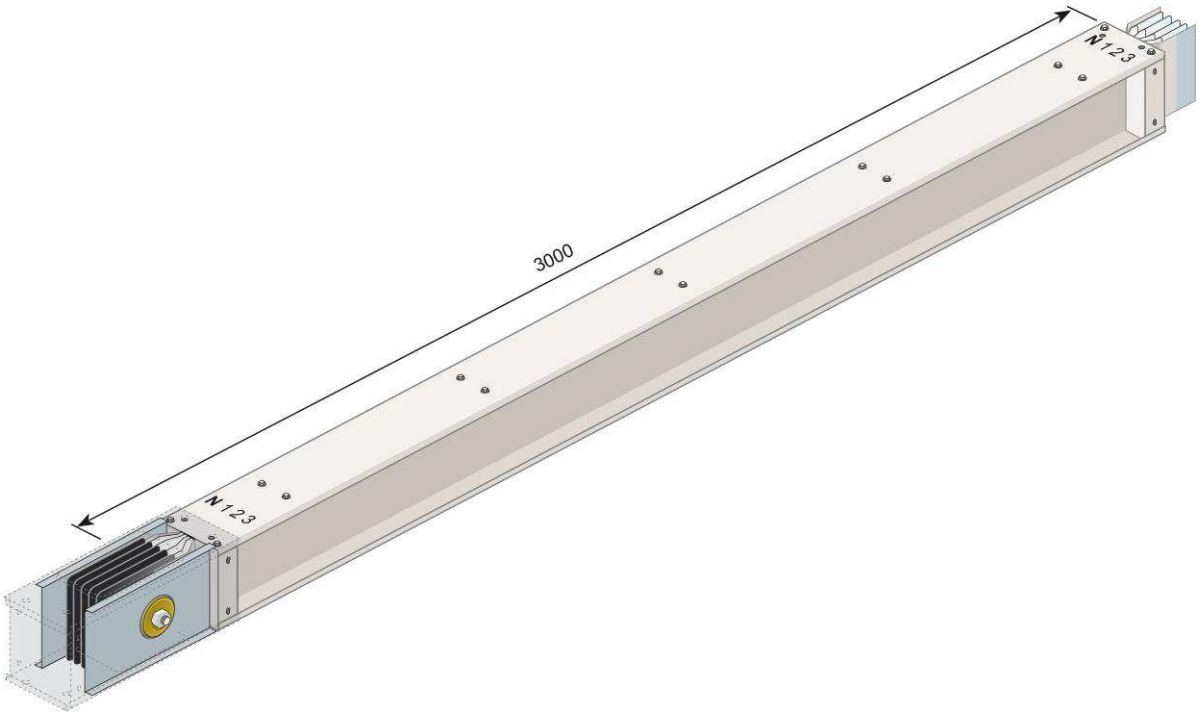
Tab. 3 Length

Length	Code
3 m	Z3
2 m	Z2
1 m	Z1
no length specified	Z0
standard up to 1m[1)]	N1
standard 1,01m - 2m[1)]	N2
standard 2,01m - 3m[1)]	N3
up to 0,75 m	S4
0,76 m to 1 m	S1
1,01 m to 1,25 m	S5
1,26 m to 1,5 m	S9
1,51 m to 1,75 m	S6
1,76 m to 2 m	S2
2,01 m to 2,25 m	S7
2,26 m to 2,5 m	S8
2,51 m to 3 m	S3
spare part	R0

[1)] only parts with change direction

4.2 Straight busbar elements

4.2.1 Straight busbar elements without plug-in



Straight busbar elements without plug-in in standard lengths (conductor material: aluminium)

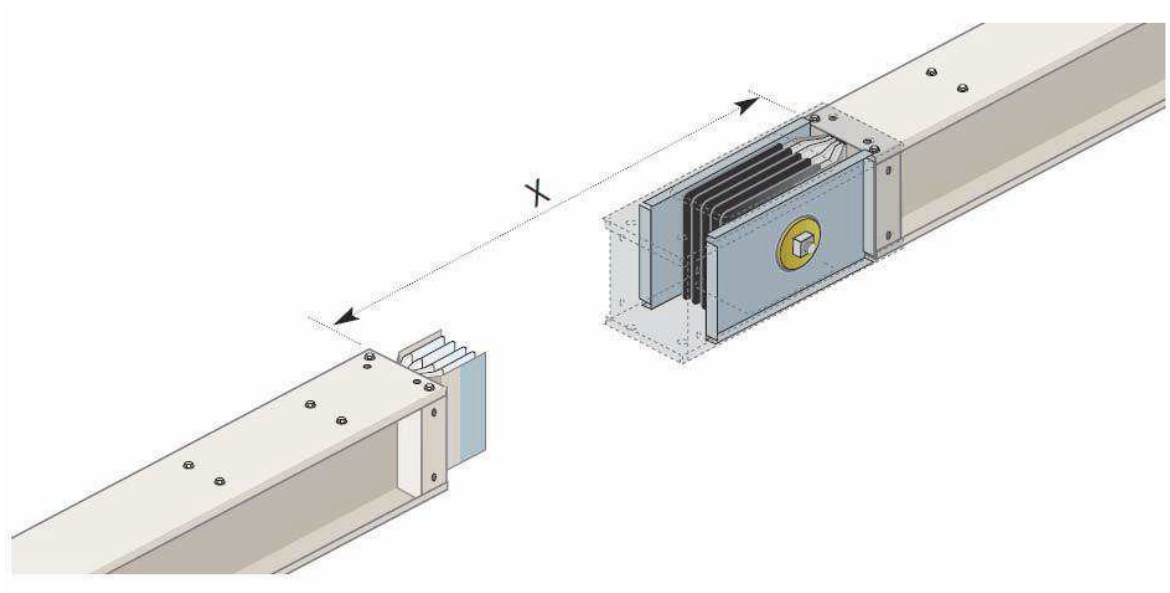
Rated current I_n	Order number 1 m	Order number 2 m	Order number 3 m
800 A	KEH33S81Z1LMA	KEH33S80Z2LMA	KEH33S00Z3LMA
1000 A	KEH34S81Z1LMA	KEH34S80Z2LMA	KEH34S00Z3LMA
1250 A	KEH35S81Z1LMA	KEH35S80Z2LMA	KEH35S00Z3LMA
1600 A	KEH36S81Z1LMA	KEH36S80Z2LMA	KEH36S00Z3LMA
2000 A	KEH37S81Z1LMA	KEH37S80Z2LMA	KEH37S00Z3LMA
2500 A	KEH31D81Z1LMA	KEH31D80Z2LMA	KEH31D00Z3LMA
3200 A	KEH32D81Z1LMA	KEH32D80Z2LMA	KEH32D00Z3LMA
4000 A	KEH33D81Z1LMA	KEH33D80Z2LMA	KEH33D00Z3LMA

Straight busbar elements without plug-in in selectable lengths (conductor material: aluminium)

Rated current I_n	Order number 760 mm to 1 m	Order number 1.76 m to 2 m	Order number 2.51 m to 3 m
800 A	KEH33S81S1LMA	KEH33S80S2LMA	KEH33S00S3LMA
1000 A	KEH34S81S1LMA	KEH34S80S2LMA	KEH34S00S3LMA
1250 A	KEH35S81S1LMA	KEH35S80S2LMA	KEH35S00S3LMA
1600 A	KEH36S81S1LMA	KEH36S80S2LMA	KEH36S00S3LMA
2000 A	KEH37S81S1LMA	KEH37S80S2LMA	KEH37S00S3LMA
2500 A	KEH31D81S1LMA	KEH31D80S2LMA	KEH31D00S3LMA
3200 A	KEH32D81S1LMA	KEH32D80S2LMA	KEH32D00S3LMA
4000 A	KEH33D81S1LMA	KEH33D80S2LMA	KEH33D00S3LMA

Other selectable lengths (p. 20), Table 3

Determining selectable lengths



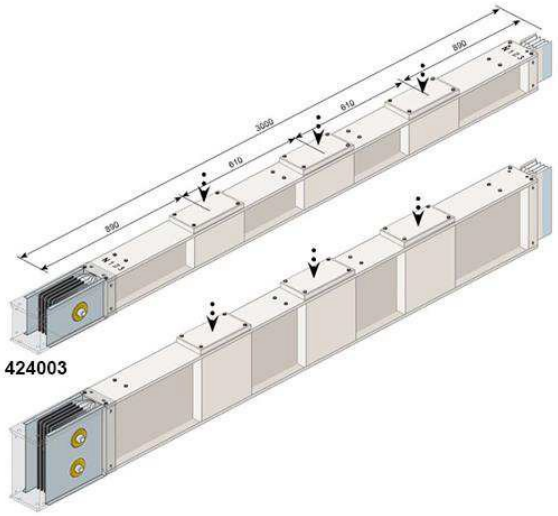
It is possible to produce selectable lengths between 410 mm and 3000 mm.

To determine the selectable length, 220 mm must be deducted from the measured distance X. This will yield the required selectable length.

4.2.2 Straight busbar elements with plug-in

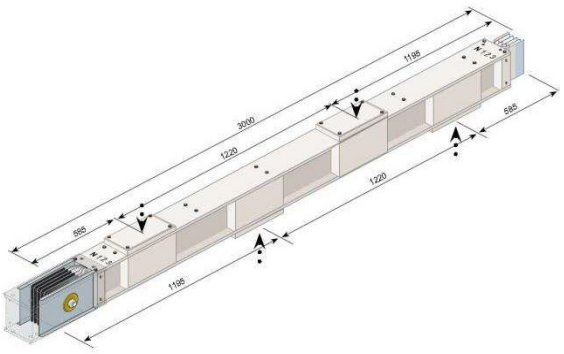
Straight lengths with plug-in, length 3 m (conductor material: aluminium)

Rated current I_n	Order number 3 m
800 A	KEH33S09Z3LMA
1000 A	KEH34S09Z3LMA
1250 A	KEH35S09Z3LMA
1600 A	KEH36S99Z3LMA
2000 A	KEH37S99Z3LMA
2500 A	KEH31D99Z3LMA
3200 A	KEH32D99Z3LMA
4000 A	KEH33D99Z3LMA



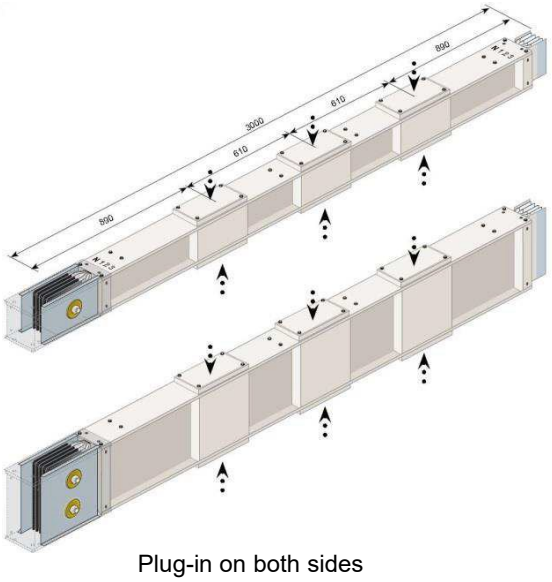
Plug-in on one side

Rated current I_n	Order number 3 m
800 A	KEH33S99Z3LMA
1000 A	KEH34S99Z3LMA
1250 A	KEH35S99Z3LMA



Plug-in offset on both sides

Rated current I_n	Order number 3 m
1600 A	KEH36S09Z3LMA
2000 A	KEH37S09Z3LMA
2500 A	KEH31D09Z3LMA
3200 A	KEH32D09Z3LMA
4000 A	KEH33D09Z3LMA



Plug-in on both sides

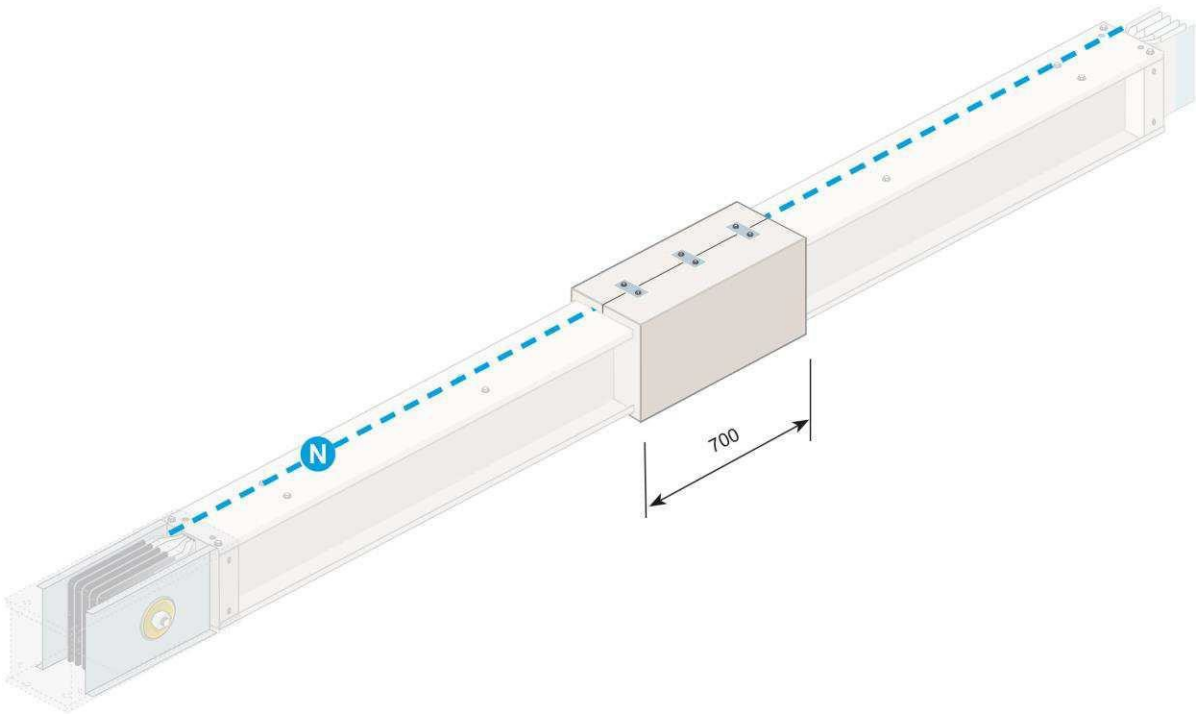
Other versions on request

4.2.3 Fire Barrier

Fire Barrier (conductor material: aluminium)

Rated current I_n	Order number
800 A	KEH33S19
1000 A	KEH34S19
1250 A	KEH35S19
1600 A	KEH36S19
2000 A	KEH37S19
2500 A	KEH31D19
3200 A	KEH32D19
4000 A	KEH33D19

Dimensions in mm		
Length	Width	Height
700	217	172
700	217	182
700	217	208
700	217	247
700	217	292
700	217	373
700	217	463
700	217	503



The asbestos-free fire barrier material for wall or ceiling meets Fire Resistance Class EI120 according to EN 13501.

The fire barrier is an accessory and must be ordered at the same time:

- Add the order number for the fire barrier to the order number for a straight busbar element.
- Also specify the exact position of the firewall.

Size of the openings: See Chapter 7.3.6 "Firewall".

4.2.4 Expansion compensation unit

The materials within any busbar runs are frequently subjected to temperature changes. This leads to differing temperature behaviours and hence to differing expansions. This expansion must be compensated for long straight busbar runs and if a busbar run is crossing an expansion joint between two parts of a building.

A special busbar element, known as an expansion compensation, is used to compensate.

Such an expansion compensation is used with straight busbar elements over 50 m or with a vertical busbar run over 30 m as well as when crossing an expansion joint between two parts of a building.

Expansion compensation (conductor material: aluminium)

Rated current I_n	Order number
800 A	KEH33S88LMA
1000 A	KEH34S88LMA
1250 A	KEH35S88LMA
1600 A	KEH36S88LMA
2000 A	KEH37S88LMA
2500 A	KEH31D88LMA
3200 A	KEH32D88LMA
4000 A	KEH33D88LMA

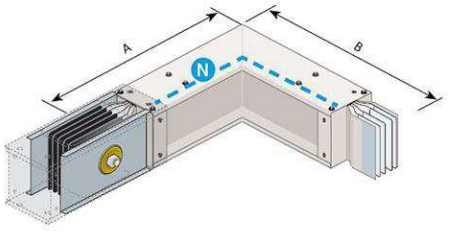
4.3 Change Directions

4.3.1 Elbow, horizontal

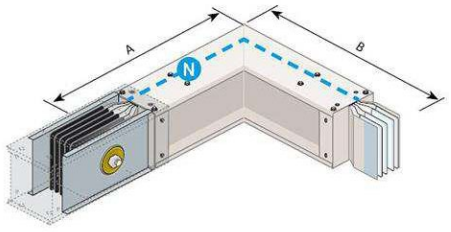
Elbow, horizontal (conductor material: aluminium)

Rated current I_n	Order number*
800 A	KEH33S01N1LMA
1000 A	KEH34S01N1LMA
1250 A	KEH35S01N1LMA
1600 A	KEH36S01N1LMA
2000 A	KEH37S01N1LMA
2500 A	KEH31D01N1LMA
3200 A	KEH32D01N1LMA
4000 A	KEH33D01N1LMA

*Order numbers for Ref. 424005



424004



424005

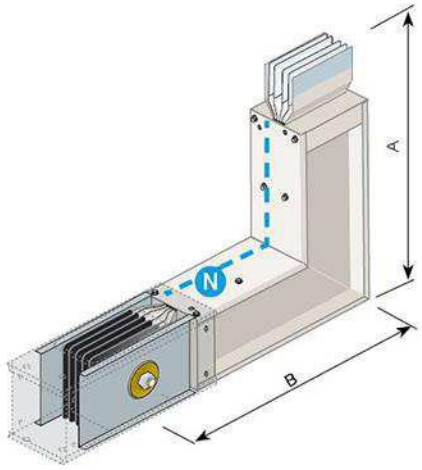
Rated current I_n	Dimensions in mm (A = B)
800 A	320
1000 A	320
1250 A	320
1600 A	320
2000 A	320
2500 A	320
3200 A	320
4000 A	320

When the cast resin system (IP68) is used, 3 mm must be added to the dimensions A and B.

4.3.2 Knee, vertical

Knee, vertical (conductor material: aluminium)

Rated current I_n	Order number
800 A	KEH33S02N1LMA
1000 A	KEH34S02N1LMA
1250 A	KEH35S02N1LMA
1600 A	KEH36S02N1LMA
2000 A	KEH37S02N1LMA
2500 A	KEH31D02N2LMA
3200 A	KEH32D02N2LMA
4000 A	KEH33D02N2LMA



4204006

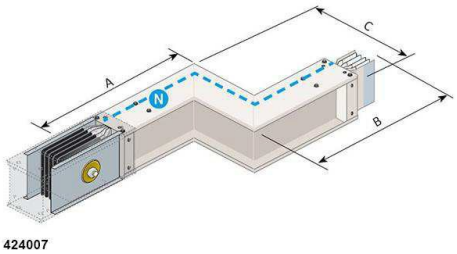
Rated current I_n	Dimensions in mm (A = B)
800 A	270
1000 A	280
1250 A	310
1600 A	350
2000 A	390
2500 A	520
3200 A	610
4000 A	650

When the cast resin system (IP68) is used, 3 mm must be added to the dimensions A and B.

4.3.3 Double horizontal change direction (Z-element)

Double horizontal elbow (Z-element, conductor material: aluminium)

Rated current I_n	Order number
800 A	KEH33S21N1LMA
1000 A	KEH34S21N1LMA
1250 A	KEH35S21N1LMA
1600 A	KEH36S21N1LMA
2000 A	KEH37S21N1LMA
2500 A	KEH31D21N1LMA
3200 A	KEH32D21N1LMA
4000 A	KEH33D21N1LMA



	Dimensions in mm		
Rated current I_n	A	B	C
800 A	320	320	200
1000 A	320	320	200
1250 A	320	320	200
1600 A	320	320	200
2000 A	320	320	200
2500 A	320	320	200
3200 A	320	320	200
4000 A	320	320	200

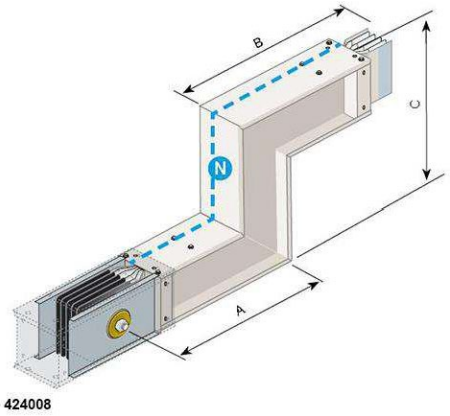
When the cast resin system (IP68) is used,
3 mm must be added to dimensions A and B
and 5 mm must be added to dimension C.

4.3.4 Double vertical change direction (Z-element)

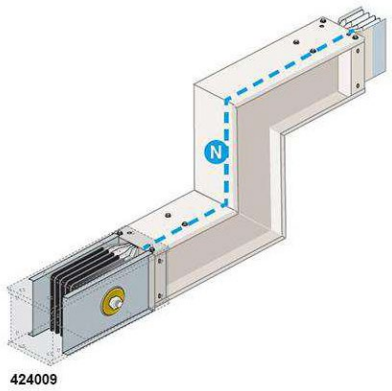
Double vertical knee (Z-element, conductor material: aluminium)

Rated current I_n	Order number*
800 A	KEH33S22N1LMA
1000 A	KEH34S22N1LMA
1250 A	KEH35S22N1LMA
1600 A	KEH36S22N1LMA
2000 A	KEH37S22N2LMA
2500 A	KEH31D22N2LMA
3200 A	KEH32D22N2LMA
4000 A	KEH33D22Z2LMA

*Order numbers for Ref. 424008



424008



424009

	Dimensions in mm		
Rated current I_n	A	B	C
800 A	270	270	185
1000 A	280	280	195
1250 A	310	310	225
1600 A	350	350	270
2000 A	390	390	320
2500 A	520	520	390
3200 A	610	610	480
4000 A	650	650	515

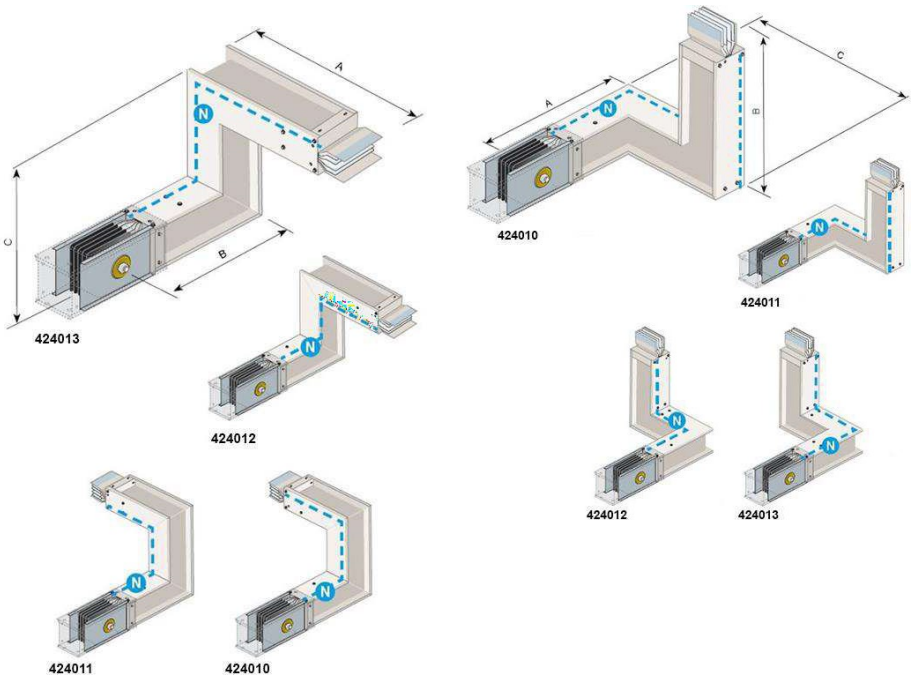
When the cast resin system (IP68) is used, 3 mm must be added to dimensions A and B and 5 mm must be added to dimension C.

4.3.5 Offset change direction (offset elbow/knee)

Offset change direction (conductor material: aluminium)

Rated current I_n	Order number*
800 A	KEH33S13N1LMA
1000 A	KEH34S13N1LMA
1250 A	KEH35S13N1LMA
1600 A	KEH36S13N2LMA
2000 A	KEH37S13N2LMA
2500 A	KEH31D13N2LMA
3200 A	KEH32D13N2LMA
4000 A	KEH33D13N2LMA

*Order numbers for Ref. 424013



	Dimensions in mm		
Rated current I_n	A	B	C
800 A	320	270	300
1000 A	320	280	310
1250 A	320	310	335
1600 A	320	350	375
2000 A	320	390	420
2500 A	320	520	500
3200 A	320	610	590
4000 A	320	650	630

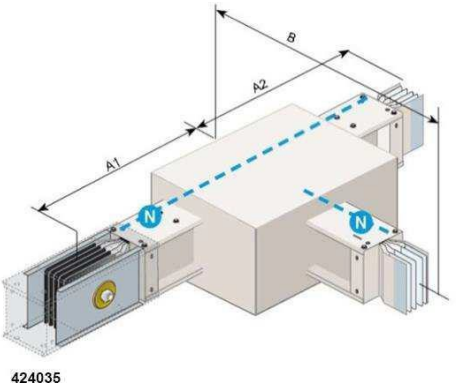
When the cast resin system (IP68) is used,
3 mm
must be added to the dimensions B and C.

4.4 T-elements

4.4.1 T-element, horizontal

T-element, horizontal (conductor material: aluminium)

Rated current I_n	Order number
800 A	KEH33S07Z2LMA
1000 A	KEH34S07Z2LMA
1250 A	KEH35S07Z2LMA
1600 A	KEH36S07Z2LMA
2000 A	KEH37S07Z2LMA
2500 A	KEH31D07Z2LMA
3200 A	KEH32D07Z2LMA
4000 A	KEH33D07Z2LMA

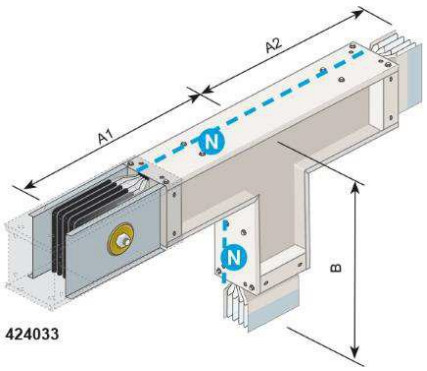


	Dimensions in mm		
Rated current I_n	A1	A2	B
800 A	600	600	600
1000 A	600	600	600
1250 A	600	600	600
1600 A	600	600	600
2000 A	600	600	600
2500 A	600	600	600
3200 A	600	600	600
4000 A	600	600	600

4.4.2 T-element, vertical

T-element, vertical (conductor material: aluminium)

Rated current I_n	Order number
800 A	KEH33S06Z2LMA
1000 A	KEH34S06Z2LMA
1250 A	KEH35S06Z2LMA
1600 A	KEH36S06Z2LMA
2000 A	KEH37S06Z2LMA
2500 A	KEH31D06Z2LMA
3200 A	KEH32D06Z2LMA
4000 A	KEH33D06Z2LMA



	Dimensions in mm		
Rated current I_n	A1	A2	B
800 A	500	500	500
1000 A	500	500	500
1250 A	500	500	500
1600 A	500	500	500
2000 A	500	500	500
2500 A	500	500	650
3200 A	500	500	650
4000 A	500	500	650

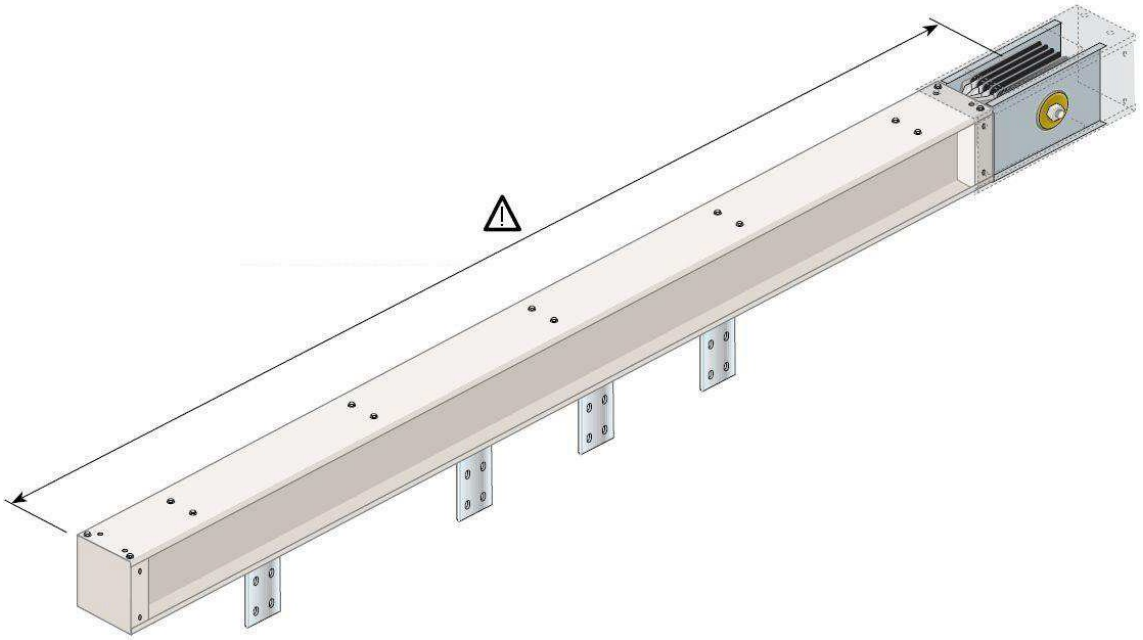
When the cast resin system (IP68) is used,
3 mm must be added to dimension B.

4.5 Connection elements

4.5.1 Transformer connection element

Transformer connection element (conductor material: aluminium)

Rated current I_n	Order number
800 A	KEH33S83S2LMA
1000 A	KEH34S83S2LMA
1250 A	KEH35S83S2LMA
1600 A	KEH36S83S2LMA
2000 A	KEH37S83S2LMA
2500 A	KEH31D83S2LMA
3200 A	KEH32D83S2LMA
4000 A	KEH33D83S2LMA

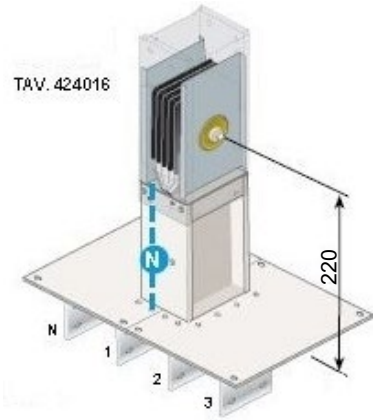


The exact dimensions depend on the size and construction of the transformer. The transformer connection element is usually 2000 mm long. The minimum phase distance is 80 mm.

4.5.2 Terminal elements

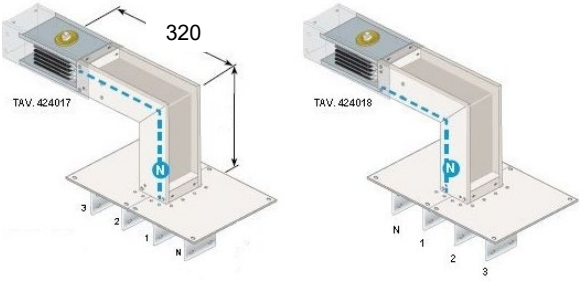
Terminal elements (conductor material: aluminium)

Rated current I_n	Order number
800 A	KEH33S03N1LMA
1000 A	KEH34S03N1LMA
1250 A	KEH35S03N1LMA
1600 A	KEH36S03N1LMA
2000 A	KEH37S03N1LMA
2500 A	KEH31D03N1LMA
3200 A	KEH32D03N1LMA
4000 A	KEH33D03N1LMA



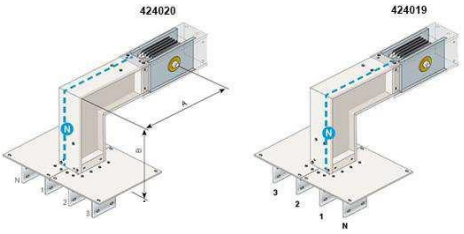
Rated current I_n	Order number*
800 A	KEH33S11N1LMA
1000 A	KEH34S11N1LMA
1250 A	KEH35S11N1LMA
1600 A	KEH36S11N1LMA
2000 A	KEH37S11N1LMA
2500 A	KEH31D11N1LMA
3200 A	KEH32D11N1LMA
4000 A	KEH33D11N1LMA

*Order numbers for Ref. 424017



Rated current I_n	Order number*
800 A	KEH33S12N1LMA
1000 A	KEH34S12N1LMA
1250 A	KEH35S12N1LMA
1600 A	KEH36S12N1LMA
2000 A	KEH37S12N1LMA
2500 A	KEH31D12N2LMA
3200 A	KEH32D12N2LMA
4000 A	KEH33D12Z2LMA

*Order numbers for Ref. 424020

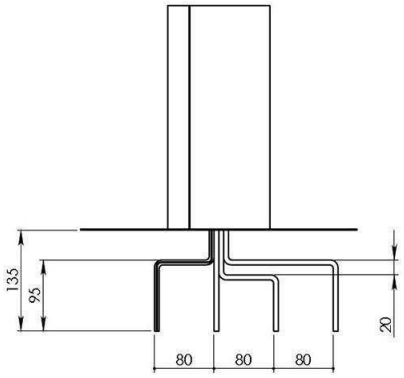


only for 424020 and 424019	Dimensions in mm	
Rated current I_n	A	B
800 A	270	185
1000 A	280	195
1250 A	310	221
1600 A	350	260
2000 A	390	305
2500 A	520	386
3200 A	610	476
4000 A	650	516

When the cast resin system (IP68) is used, 3 mm must be added to each of dimensions A and B.

Conductor configurations of terminal elements

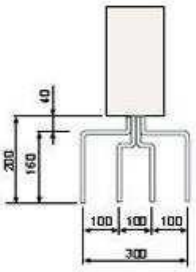
Standard for unimes H:



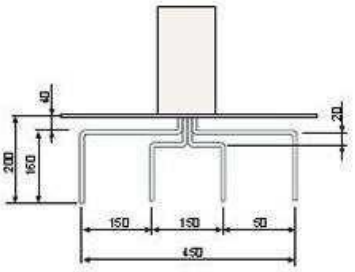
Another phase sequence is possible

Other possibilities:

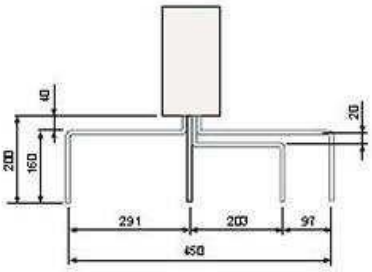
Type S



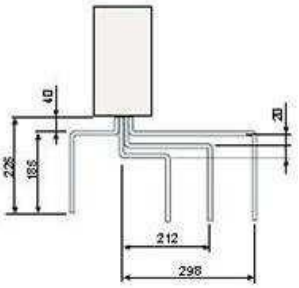
Type A



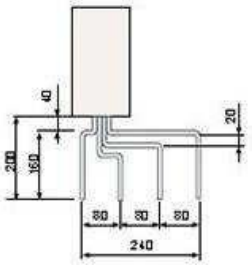
Type B



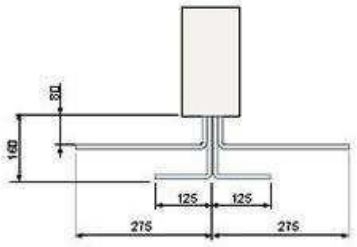
Type C



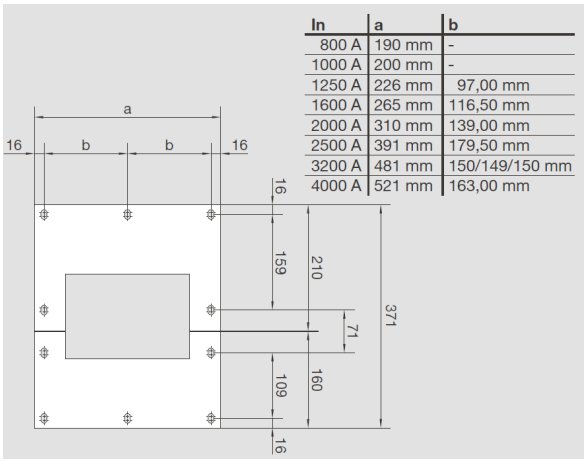
Type D



Type E



Dimensions of the connection flanges for terminal elements



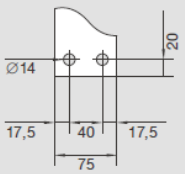
In	a	b
800 A	190 mm	-
1000 A	200 mm	-
1250 A	226 mm	97,00 mm
1600 A	265 mm	116,50 mm
2000 A	310 mm	139,00 mm
2500 A	391 mm	179,50 mm
3200 A	481 mm	150/149/150 mm
4000 A	521 mm	163,00 mm

4.6 Drill holes for connecting flanges

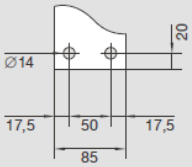
4.6.1 Standard type

Drill holes in connecting flanges (aluminium conductors)

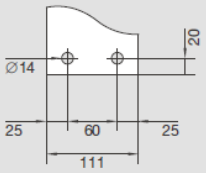
Al 800 A



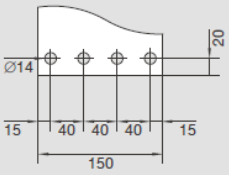
Al 1000 A



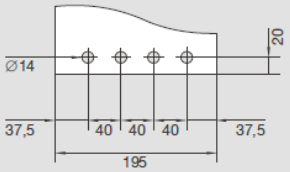
Al 1250 A



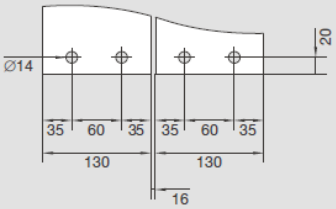
Al 1600 A



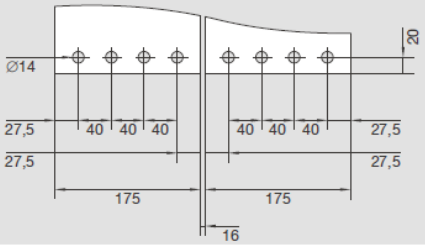
Al 2000 A



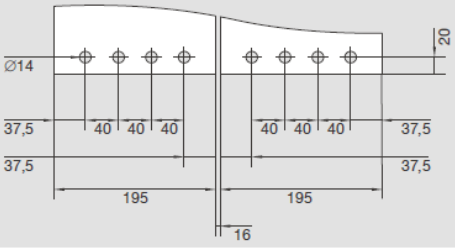
Al 2500 A



Al 3200 A



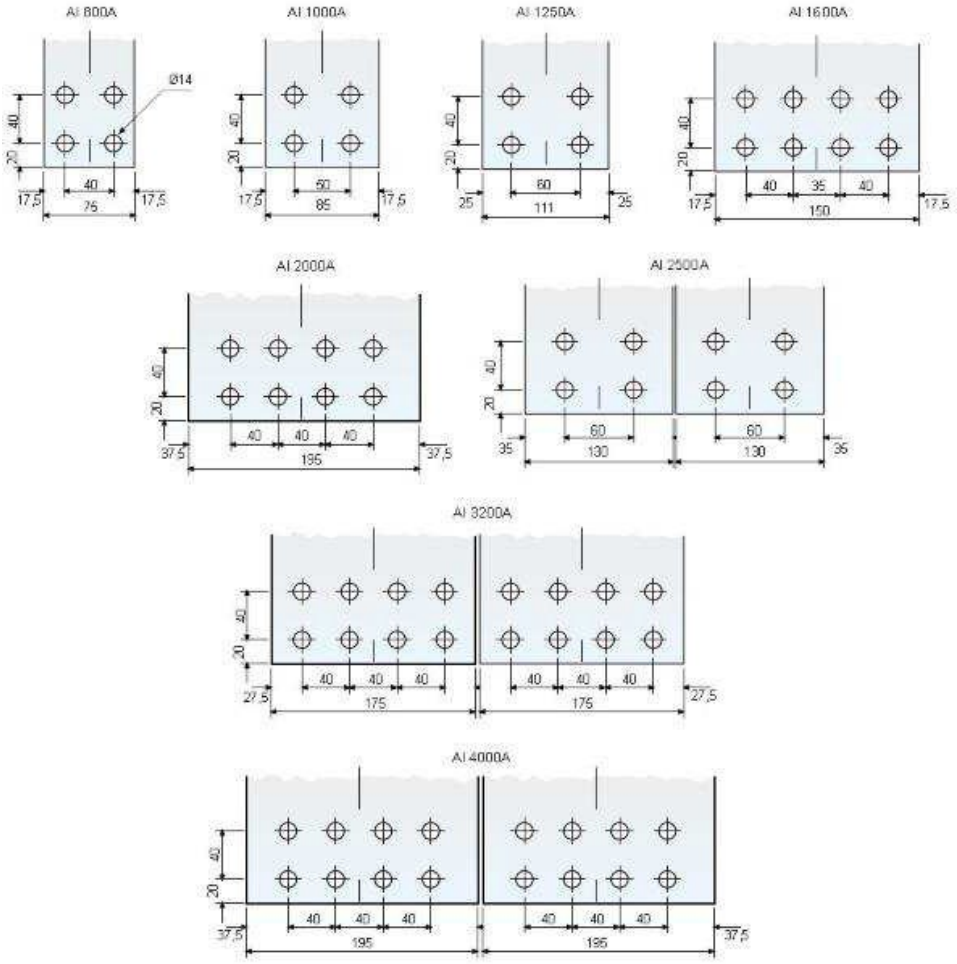
Al 4000 A



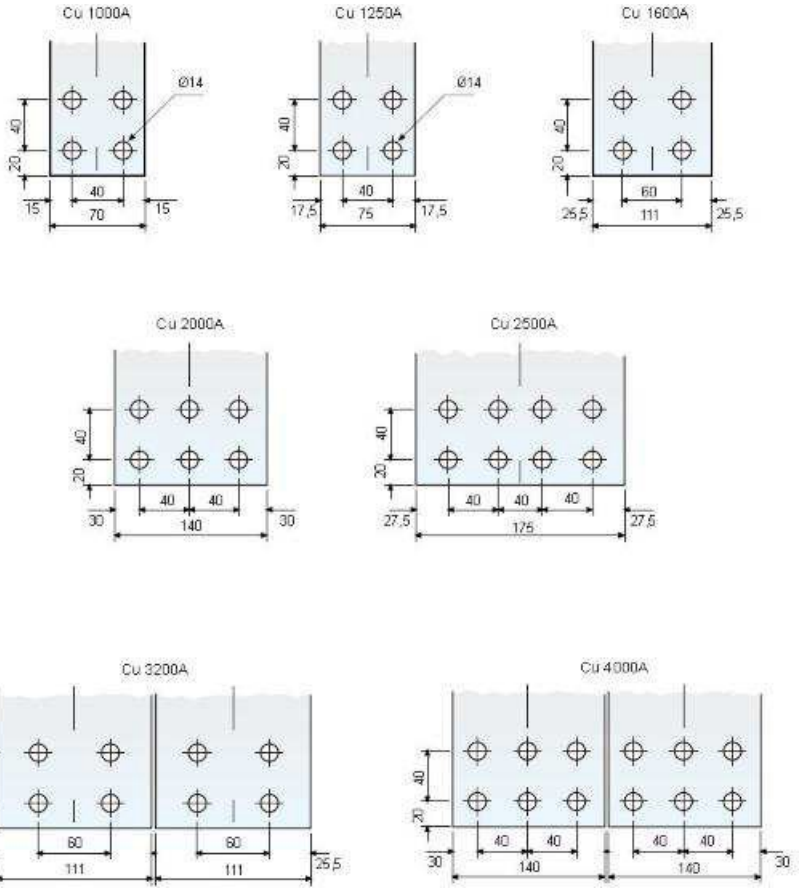
4.6.2 Other types

Drill holes in connecting flanges of terminal elements

Aluminium



Copper

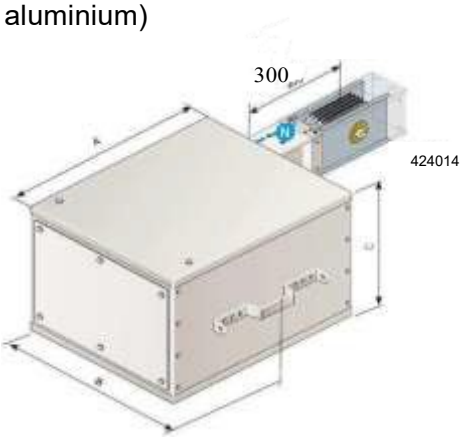

Cu 1000A
Ø14
40
20
15
40
70
15
Cu 1250A
Ø14
40
20
17,5
40
75
17,5
Cu 1600A
40
20
25,5
60
111
25,5
Cu 2000A
40
20
30
40
40
140
30
Cu 2500A
40
20
27,5
40
40
40
175
27,5
Cu 3200A
40
20
25,5
60
60
111
111
25,5
Cu 4000A
40
20
30
40
40
40
40
140
140
30

4.7 Cable feeder

4.7.1 Cable end feeder

Cable end feeder (conductor material: aluminium)

Rated current I_n	Order number*
800 A	KEH33S51Z0LMA
1000 A	KEH34S51Z0LMA
1250 A	KEH35S51Z0LMA
1600 A	KEH36S51Z0LMA
2000 A	KEH37S51Z0LMA
2500 A	KEH31D51Z0LMA
3200 A	KEH32D51Z0LMA
4000 A	KEH33D51Z0LMA



*Order numbers for Ref. 424014

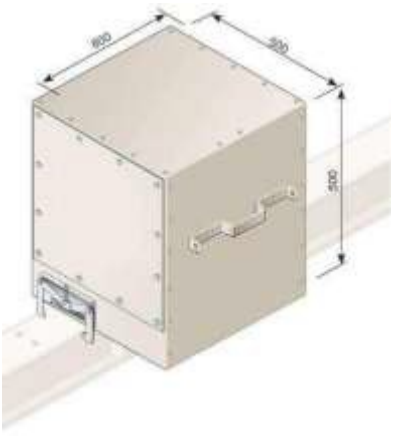
	Dimensions in mm		
Rated current I_n	A	B	C
800 A	450	474	300
1000 A	450	474	300
1250 A	450	474	320
1600 A	450	474	390
2000 A	450	474	440
2500 A	450	474	490
3200 A	450	474	580
4000 A	450	474	620

Dimension B including the handle is 560 mm.

4.7.2 Cable intermediate feeder

Cable intermediate feeder (conductor material: aluminium)

Rated current I_n	Order number
800 A	KEH33S53Z0LMA
1000 A	KEH34S53Z0LMA
1250 A	KEH35S53Z0LMA
1600 A	KEH36S53Z0LMA
2000 A	KEH37S53Z0LMA



Can be used at connection joints

4.8 Tap-off units

- The distribution of energy using tap-off units is only possible for a busbar system with protection type IP55 / IP65 (the busbar system with protection type IP68 is intended exclusively for energy transport).
- Selection, assembly and installation of tap-off units and protective equipment may only be undertaken by electrical specialists.

4.8.1 Type key for tap-off units

Tap-off boxes Ordercode: K E A n n n α n

Tap-off box for joint = 3	
Tap-off box for plug-in (standard) = 4	
Prefitted for DIN-rail moduls = 4	
Interrupted neutral (4-pols) = 5	
Direct neutral (3-pols) = 7	
Current rate (see table 4)	
With isolator and fuses (NH) = F	
With MCCB (h3) = B	
With MCCB (h3+) = G	
With fuse-base = D	
empty = E	
Manual (standard) = 1	
Motor (only MCCB) = 2	

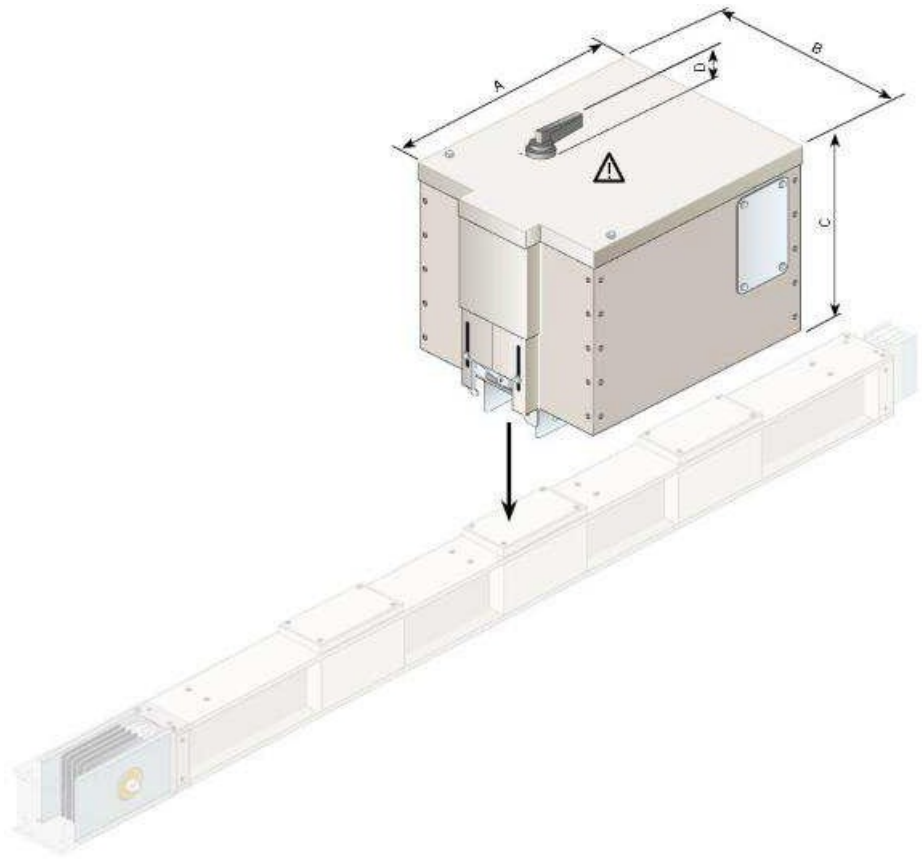
Tab. 4

In [A]	fuses	MCCB
125	0	0
250	1	1
400	3	3
630	4	4

Examples:

- Tap-off unit 250 A with HRC fused switch disconnector, for plug-in, 3-pole: KEA371F1
- Tap-off unit 250 A with HRC fused switch disconnector, for plug-in, 4-pole: KEA351F1

4.8.2 Tap-off units for plug-in



- The tap-off units can be plugged into plug-in on straight busbar elements while voltage is applied (taking account of EN 50110 and national regulations).
- They can be plugged into any busbar system with IP55 / IP65, regardless of the rated current of the straight busbar elements.
- The tap-off unit can be neither plugged in nor removed while the protection device is switched on. This is only possible when the protection device is switched off.
- All tap-off units are delivered without fuses.

Tap-off unit, empty or for HRC fuses

Rated current I_n	Order number	Switchgear	Number of poles	A	B	C	D	Cable size
125 A	KEA440E1	empty	--	517	306	263	0	--
125 A	KEA470D1	L00	3	517	306	263	0	--
125 A	KEA470F1	HFD312	3	517	306	263	41	95 mm²
125 A	KEA450F1	HFD412	4	517	306	263	41	95 mm²
250 A	KEA441E1	empty	--	576	495	385	0	--
250 A	KEA471F1	HFD325	3	576	495	385	41	240 mm²
250 A	KEA451F1	HFD425	4	576	495	385	41	240 mm²
400 A	KEA443E1	empty	--	576	495	385	0	--
400 A	KEA473F1	HFD340	3	576	495	385	41	240 mm²
400 A	KEA453F1	HFD440	4	576	495	385	41	240 mm²
630 A	KEA444E1	empty	--	946	495	385	0	--
630 A	KEA474F1	HFD363	3	946	495	385	41	2 x 300 mm²
630 A	KEA454F1	HFD463	4	946	495	385	41	2 x 300 mm²

Empty tap-off units are provided with a mounting plate. All dimensions specified in mm.

Tap-off unit with circuit breaker

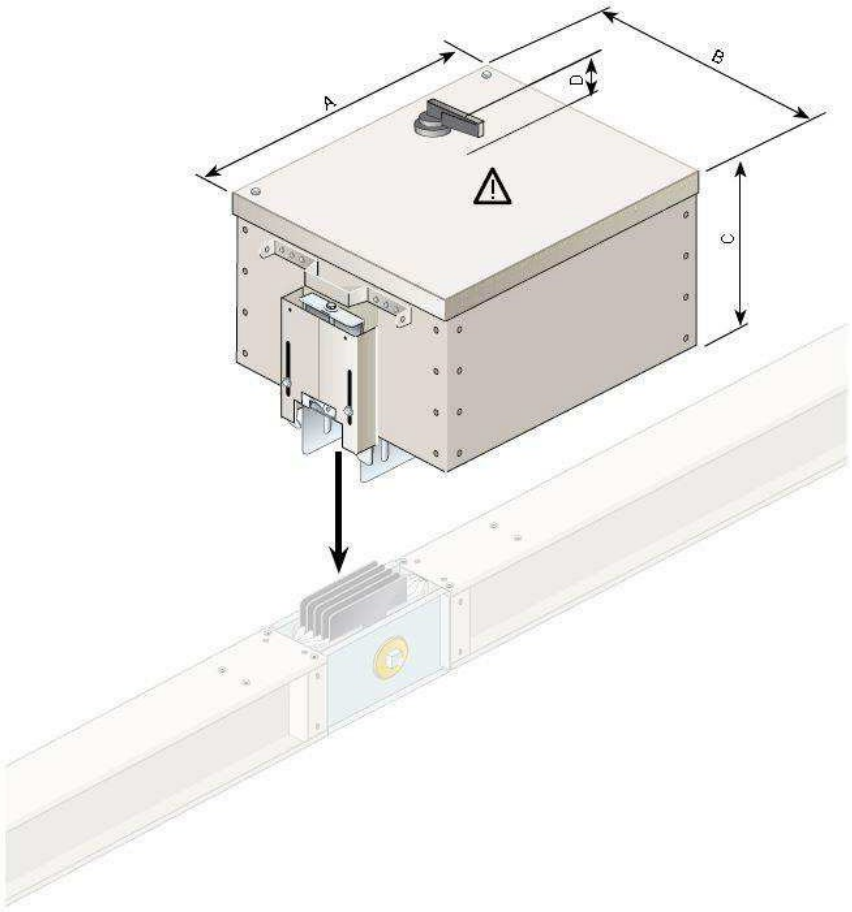
Rated current I_n	Order number	Switchgear	Number of poles	A	B	C	D	Cable size
125 A	KEA470G1	HNS160JC	3	517	300	263	36	95 mm²
125 A	KEA450G1	HNS161JC	4	517	300	263	36	95 mm²
250 A	KEA471G1	HNT250JR	3	576	495	385	36	185 mm²
250 A	KEA451G1	HNT251JR	4	576	495	385	36	185 mm²
400 A	KEA473G1	HNW400JR	3	946	495	385	41	240 mm²
400 A	KEA453G1	HNW401JR	4	946	495	385	41	240 mm²
630 A	KEA474G1	HNW630JR	3	946	495	385	41	240 mm²
630 A	KEA454G1	HNW631JR	4	946	495	385	41	240 mm²

Version with motor drive also possible. All dimensions specified in mm.

Please note:

- Dimension B specified without side handles.
- To take account of the side handles, another 86 mm are added to dimension B (for 125 A version: 70 mm).

4.8.3 Tap-off units for connection joints



The tap-off units can be installed between all straight busbar elements of protection type IP55/IP65, regardless of the rated current of the busbar elements.

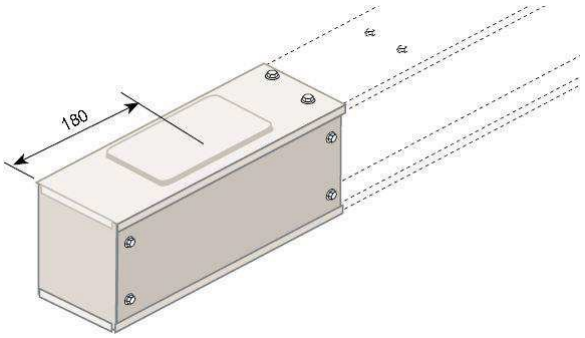
- In the case of tap-off units for connection joints, a suitable joint block appropriate for the rated current of the busbar system must be ordered at the same time. The joint block for tap-off units replaces the standard joint block.
- All tap-off units are delivered without fuses.

4.9 Accessories

4.9.1 End flange

End flange (conductor material: aluminium)

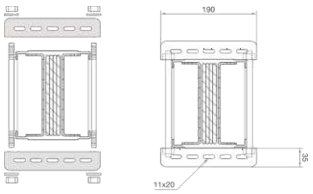
Rated current I_n	Order number
800 A	KEH33S10Z0LMA
1000 A	KEH34S10Z0LMA
1250 A	KEH35S10Z0LMA
1600 A	KEH36S10Z0LMA
2000 A	KEH37S10Z0LMA
2500 A	KEH31D10Z0LMA
3200 A	KEH32D10Z0LMA
4000 A	KEH33D10Z0LMA



4.9.2 Fastening material

Hanger assembly (conductor material: aluminium)

Rated current I_n	Order number
800 A	KEH33S20
1000 A	KEH34S20
1250 A	KEH35S20
1600 A	KEH36S20
2000 A	KEH37S20
2500 A	KEH31D20
3200 A	KEH32D20
4000 A	KEH33D20



Maximum fastener distance:

- 3 m for upright bar position
- 2 m for flat bar position
- Doubled systems - always 2 m

4.9.3 Joint block, standard (spare part)

Standard joint block (conductor material: aluminium)

Rated current I_n	Order number
800 A	KEH33S29
1000 A	KEH34S29
1250 A	KEH35S29
1600 A	KEH36S29
2000 A	KEH37S29
2500 A	KEH31D29
3200 A	KEH32D29
4000 A	KEH33D29

The insulating material is temperature resistant up to 200 °C.

Fitting a tap-off unit for connection joints is not possible with this joint block.

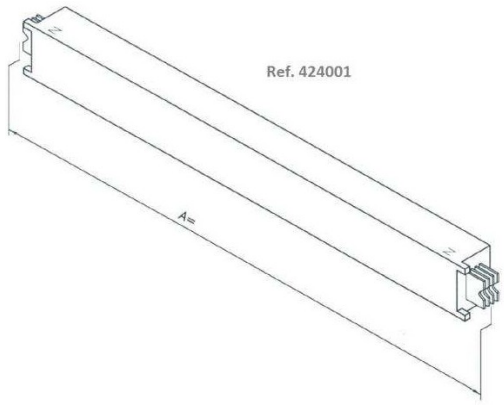
4.9.4 Joint block for tap-off units

For fitting a tap-off unit for connection joints.

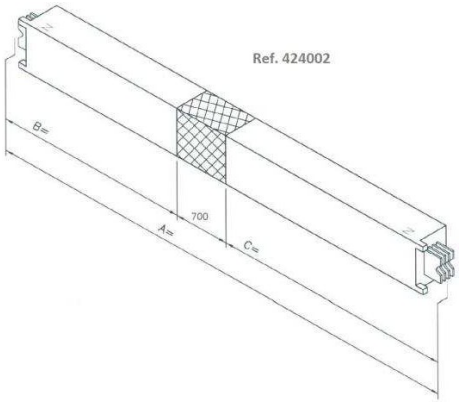
Joint block for tap-off units (conductor material: aluminium)

Rated current I_n	Order number
800 A	KEH33S79
1000 A	KEH34S79
1250 A	KEH35S79
1600 A	KEH36S79
2000 A	KEH37S79
2500 A	KEH31D79
3200 A	KEH32D79
4000 A	KEH33D79

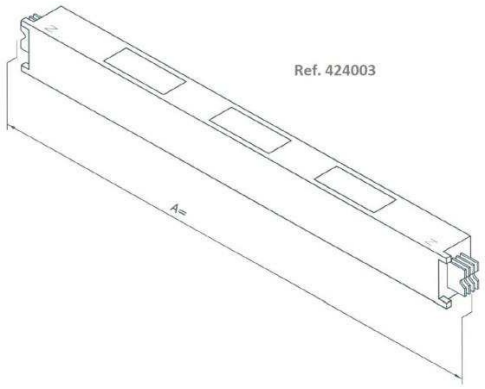
5 Sketches of busbar elements



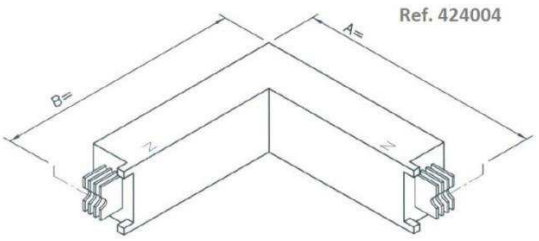
Straight lengths 3 m (code 00), 2 m (code 80) and 1 m (code 81) without plug-in



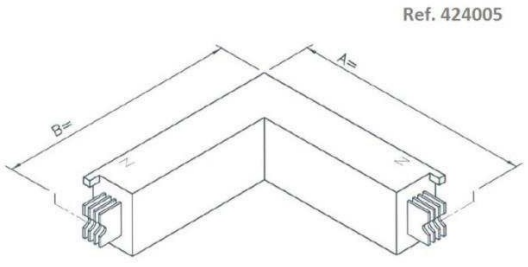
Fire barrier (code 19)



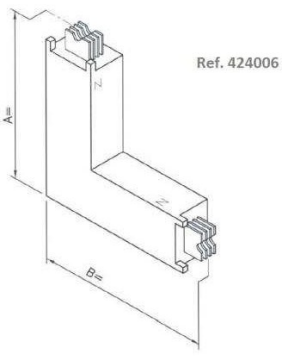
Straight lengths with plug-in



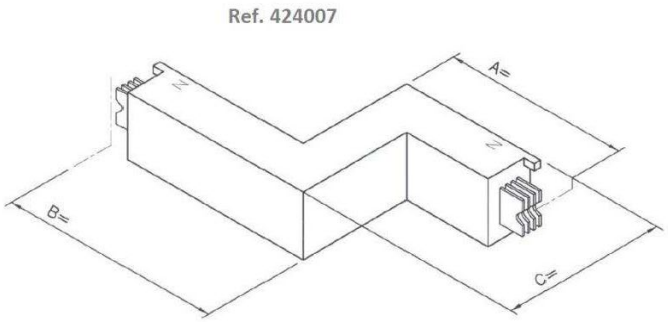
Horizontal elbow, N inside (code 04)



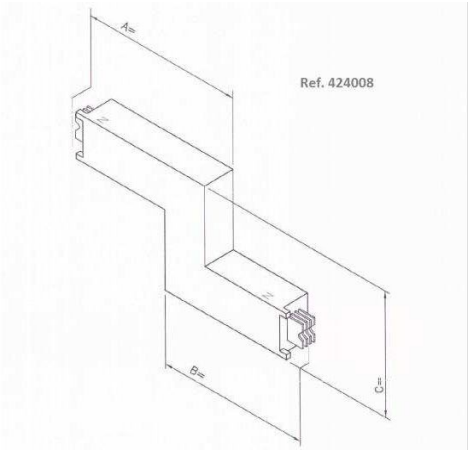
Horizontal elbow, N outside (code 01)



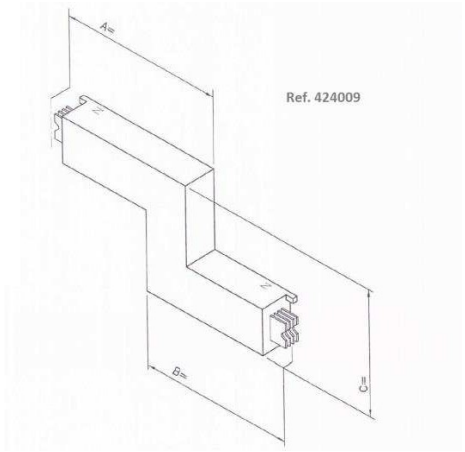
Vertical knee (code 02)



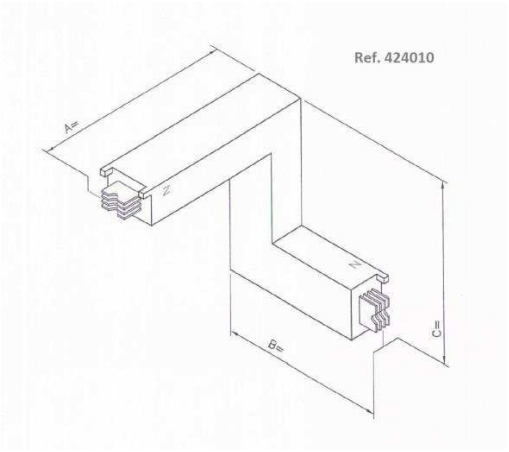
Z-element horizontal (code 21)



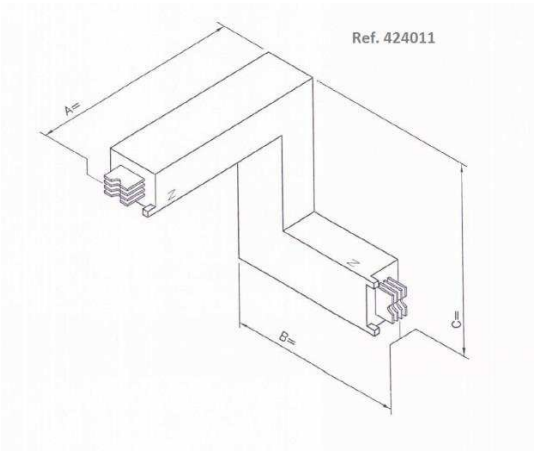
Z-element vertical, N on left (code 22)



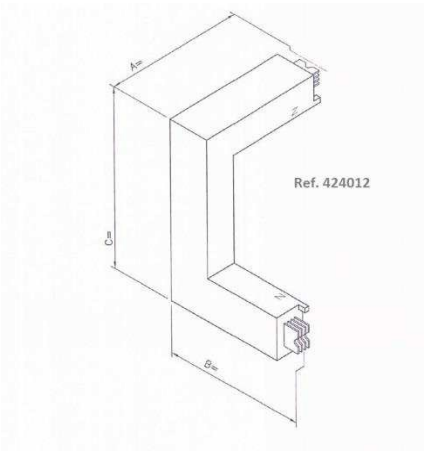
Z-element vertical, N on right (code 23)



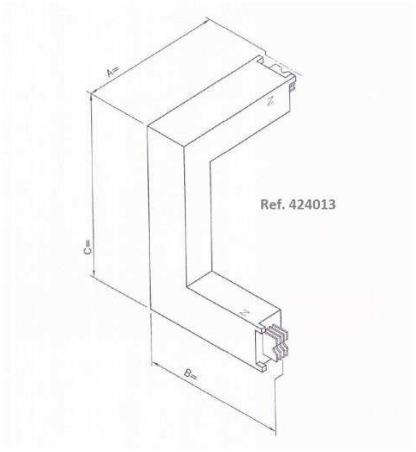
Offset change direction (code 16)



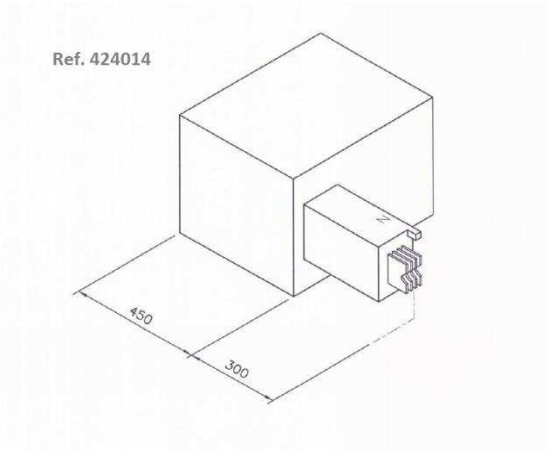
Offset change direction (code 15)



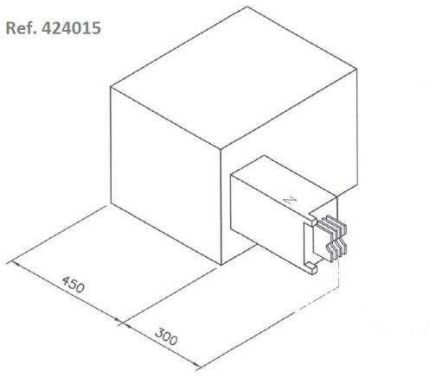
Offset change direction (code 14)



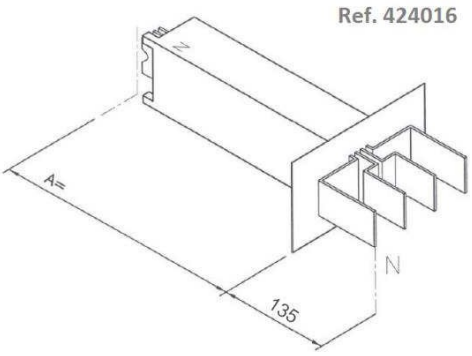
Offset change direction (code 13)



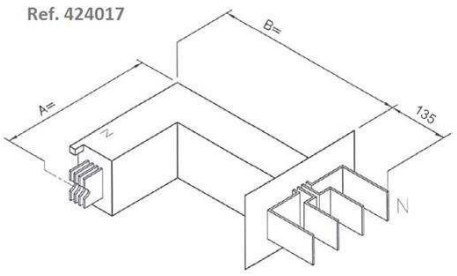
Cable end feeder, N on right (code 51)



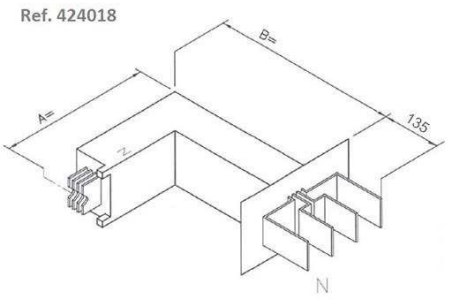
Cable end feeder, N on left (code 52)



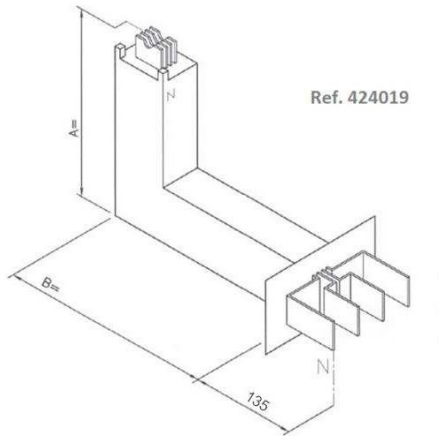
Standard distributor connection (code 03)



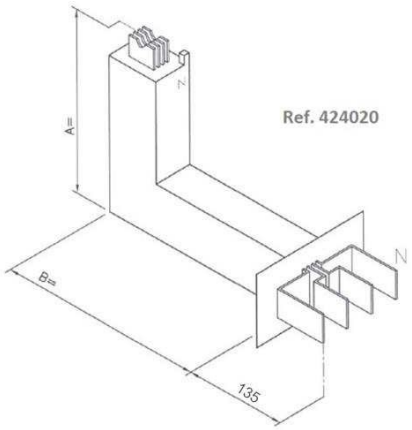
Terminal connection with knee, N on outside (code 11)



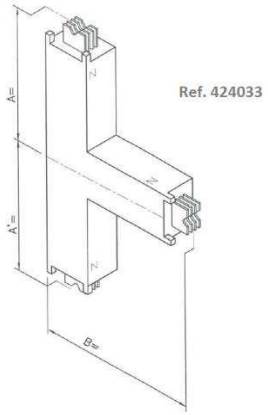
Terminal connection with knee, N on inside (code 31)



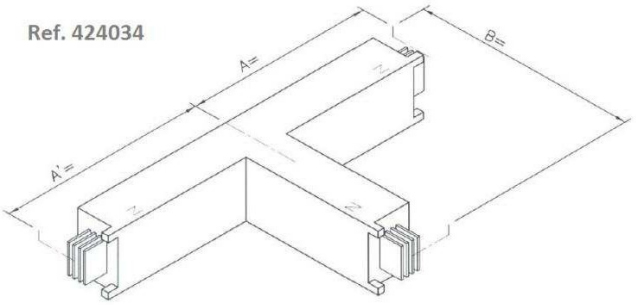
Terminal connection with knee, N on left (code 32)



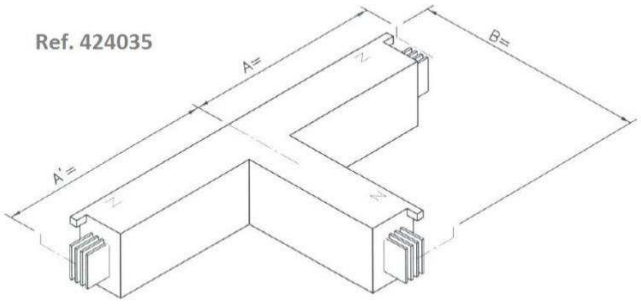
Terminal connection with knee, N on right (code 12)



T-element, vertical (code 06)



T-element, horizontal, N on right (code 08)



T-element, horizontal, N on left (code 07)

6 Technical data

6.1 Conductors aluminium, 4 bars (N, L1, L2, L3), PE housing

Rated current I_n [A]	800	1000	1250	1600	2000	2500	3200	4000
Rated insulation voltage U_i [V]	1000	1000	1000	1000	1000	1000	1000	1000
Rated operating voltage U_e [V]	1000	1000	1000	1000	1000	1000	1000	1000
Rated frequency f [Hz]	50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60
Housing	Galvanised sheet steel painted in RAL7035							
Protection type	IP55	IP55	IP55	IP55	IP55	IP55	IP55	IP55
Conductor cross-section L1, L2, L3, N [mm²]	484	548	716	968	1258	1677	2257	2516
PE cross-section [mm² eq.Cu]	120	124	134	148	165	195	225	244
Rated short time withstand current 3-pole, (1s) I_{cw}	40	50	65	80	80	90	100	115
Rated peak withstand current 3-pole, I_{pk} [kA]	84	105	143	176	176	198	220	253
Max.thermal load I^2t [A^2s 10^6]	1600	2500	4225	6400	6400	10000	10000	13225
Rated short-time withstand current 1-pole phase-N, (1s) I_{cw} [kA]	24	30	39	48	48	54	60	69
Rated short-time withstand current 1-pole phase-PE, (1s) I_{cw} [kA]	24	30	39	48	48	54	60	69
Rated peak withstand current 1-pole phase-N, I_{pk} [kA]	53	66	86	106	106	119	132	152
Rated peak withstand current 1-pole, phase-PE, I_{pk} [kA]	53	66	86	106	106	119	132	152
Effective resistance R_{20} [mΩ/m]	0.0661	0.0584	0.0447	0.0331	0.0254	0.0191	0.0142	0.0127
Impedance Z_{20} [mΩ/m]	0.0683	0.0605	0.0471	0.0359	0.0273	0.0200	0.0150	0.0137
Effective resistance R_1 [mΩ/m]	0.0700	0.0675	0.0503	0.0408	0.0324	0.0232	0.0185	0.0162
Reactance X_1 [mΩ/m]	0.0170	0.0160	0.0150	0.0140	0.0100	0.0060	0.0050	0.0050
Impedance Z_1 [mΩ/m]	0.0720	0.0694	0.0525	0.0431	0.0339	0.0239	0.0192	0.0169
Resistance of PE conductor (housing) [mΩ/m]	0.141	0.136	0.126	0.114	0.102	0.086	0.074	0.069
Fault loop resistance phase-PE [mΩ/m]	0.202	0.190	0.166	0.143	0.124	0.102	0.085	0.083
Fault loop reactance phase-PE [mΩ/m]	0.100	0.100	0.060	0.050	0.040	0.030	0.020	0.020
Fault loop impedance phase-PE [mΩ/m]	0.225	0.214	0.177	0.151	0.130	0.107	0.087	0.085
Heat loss $3RI^2$ [W/m]	134.4	202.5	235.6	313.3	388.6	434.5	568	777.2
Dimensions W x H [mm]	137 x 85	137x95	137x121	137x160	137x205	137x286	137x376	137x416
Fire load without plug-in [kWh/m]	0.98	1.06	1.38	1.81	2.29	3.14	4.09	4.57
Weight (IP55, IP65) [kg/m]	19.7	19.9	20.5	24.9	28	41	49.2	53
Weight when cast with casting resin (IP68) [kg/m]	21.9	22.3	23.4	28.6	32.6	48.2	58.1	62.7

6.2 Conductors aluminium, 5 bars (N, L1, L2, L3, PE2), PE housing

Rated current I_n [A]	800	1000	1250	1600	2000	2500	3200	4000
Rated insulation voltage U_i [V]	1000	1000	1000	1000	1000	1000	1000	1000
Rated operating voltage U_e [V]	1000	1000	1000	1000	1000	1000	1000	1000
Rated frequency f [Hz]	50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60
Housing	Galvanised sheet steel painted in RAL7035							
Protection type	IP55	IP55	IP55	IP55	IP55	IP55	IP55	IP55
Conductor cross-section L1,L2,L3,N [mm²]	484	548	716	968	1258	1677	2257	2516
Total PE cross-section [mm² eq. Cu]	389	425	518	658	819	1052	1375	1519
Rated short-time withstand current 3-pole, (1s) I_{cw} [kA]	40	50	65	80	80	90	100	115
Rated peak withstand current 3-pole, I_{pk} [kA]	88	110	143	176	176	198	220	253
Max. thermal load I^2t [$A^2s\ 10^6$]	1600	2500	4225	6400	6400	10000	10000	13225
Rated short-time withstand current 1-pole phase-N, (1s) I_{cw} [kA]	24	30	39	48	48	54	60	69
Rated short-time withstand current 1-pole phase-PE, (1s) I_{cw} [kA]	24	30	39	48	48	54	60	69
Rated peak withstand current 1-pole phase-N, I_{pk} [kA]	53	66	86	106	106	119	132	152
Rated peak withstand current 1-pole, phase-PE, I_{pk} [kA]	53	66	86	106	106	119	132	152
Effective resistance R_{20} [mΩ/m]	0.0661	0.0584	0.0447	0.0331	0.0254	0.0191	0.0142	0.0127
Impedance Z_{20} [mΩ/m]	0.0683	0.0605	0.0471	0.0359	0.0273	0.0200	0.0150	0.0137
Effective resistance R_1 [mΩ/m]	0.0700	0.0675	0.0503	0.0408	0.0324	0.0232	0.0185	0.0162
Reactance X_1 [mΩ/m]	0.0170	0.0160	0.0150	0.0140	0.0100	0.0060	0.0050	0.0050
Impedance Z_1 [mΩ/m]	0.0720	0.0694	0.0525	0.0431	0.0339	0.0239	0.0192	0.0169
Resistance of PE conductor [mΩ/m]	0.045	0.041	0.033	0.026	0.02	0.016	0.012	0.011
Fault loop resistance phase-PE [mΩ/m]	0.107	0.096	0.075	0.056	0.044	0.034	0.025	0.023
Fault loop reactance phase-PE [mΩ/m]	0.100	0.100	0.060	0.050	0.040	0.030	0.020	0.020
Fault loop impedance phase-PE [mΩ/m]	0.146	0.139	0.073	0.061	0.048	0.037	0.026	0.024
Heat loss $3RI^2$ [W/m]	134.4	202.5	235.6	313.3	388.6	434.5	568	777.2
Dimensions W x H [mm]	137 x 85	137x95	137x121	137x160	137x205	137x286	137x376	137x416
Weight (IP55, IP65) [kg/m]	21.7	21.9	22.6	27.4	32.3	45.1	54.1	58.3
Weight when cast with casting resin (IP68) [kg/m]	23.2	23.5	24.4	29.6	35	51.7	59.6	64.2

6.3 Conductors copper, 4 bars (N, L1, L2, L3), PE housing

Rated current I_n [A]	1000	1250	1600	2000	2500	3200	4000
Rated insulation voltage U_i [V]	1000	1000	1000	1000	1000	1000	1000
Rated operating voltage U_e [V]	1000	1000	1000	1000	1000	1000	1000
Rated frequency f [Hz]	50/60	50/60	50/60	50/60	50/60	50/60	50/60
Housing	Galvanised sheet steel painted in RAL7035						
Protection type	IP55	IP55	IP55	IP55	IP55	IP55	IP55
Conductor cross-section L1,L2,L3,N [mm²]	350	484	716	903	1129	1432	1806
PE cross-section [mm² eq.Cu]	120	120	134	144	158	181	203
Rated short-time withstand current 3-pole, (1s) I_{cw} [kA]	50	60	80	85	88	100	100
Rated peak withstand current 3-pole, I_{pk} [kA]	105	132	176	187	194	220	220
Max.thermal load I^2t [A^2s]	2500	3600	6400	7225	7744	10000	10000
Rated short-time withstand current 1-pole phase-N, (1s) I_{cw} [kA]	30	36	48	51	53	60	60
Rated short-time withstand current 1-pole phase-PE, (1s) I_{cw} [kA]	30	36	48	51	53	60	60
Rated peak withstand current 1-pole phase-N, I_{pk} [kA]	66	79	106	112	116	132	132
Rated peak withstand current 1-pole, phase-PE, I_{pk} [kA]	66	79	106	112	116	132	132
Effective resistance R_{20} [mΩ/m]	0.0457	0.0331	0.0223	0.0177	0.0142	0.0112	0.0089
Impedance Z_{20} [mΩ/m]	0.0495	0.0372	0.0269	0.0226	0.0173	0.0127	0.0107
Effective resistance R_1 [mΩ/m]	0.0523	0.0398	0.0277	0.0218	0.0177	0.0121	0.0108
Reactance X_1 [mΩ/m]	0.0190	0.0170	0.0150	0.0140	0.0100	0.0060	0.0060
Impedance Z_1 [mΩ/m]	0.0556	0.0433	0.0315	0.0259	0.0204	0.0135	0.0123
Resistance of PE conductor (housing) [mΩ/m]	0.1406	0.1406	0.1217	0.1126	0.1032	0.0897	0.0801
Fault loop resistance phase-PE [mΩ/m]	0.186	0.174	0.144	0.130	0.117	0.101	0.089
Fault loop reactance phase-PE [mΩ/m]	0.100	0.100	0.060	0.050	0.040	0.030	0.020
Fault loop impedance phase-PE [mΩ/m]	0.211	0.200	0.156	0.140	0.124	0.105	0.091
Heat loss $3RI^2$ [W/m]	156.9	186.5	212.7	261.6	331.9	371.7	518.4
Dimensions W x H [mm]	137 x 85	137x85	137x121	137x150	137x185	137x248	137x306
Fire load without plug-in [kWh/m]	0.98	0.98	1.38	1.81	2.05	2.77	3.62
Weight (IP55, IP65) [kg/m]	28.5	30.5	43.2	46.9	58.9	80.1	103.5
Weight when cast with casting resin (IP68) [kg/m]	31	32.7	46.2	50.4	63.1	86.5	111.1

6.4 Conductors copper, 5 bars (N, L1, L2, L3, PE2), PE housing

Rated current I_n [A]	1000	1250	1600	2000	2500	3200	4000
Rated insulation voltage U_i [V]	1000	1000	1000	1000	1000	1000	1000
Rated operating voltage U_e [V]	1000	1000	1000	1000	1000	1000	1000
Rated frequency f [Hz]	50/60	50/60	50/60	50/60	50/60	50/60	50/60
Housing	Galvanised sheet steel painted in RAL7035						
Protection type	IP55	IP55	IP55	IP55	IP55	IP55	IP55
Conductor cross-section L1,L2,L3,N [mm²]	350	484	716	903	1129	1432	1806
Total PE cross-section [mm² eq. Cu]	470	604	850	904	1273	1590	1987
Rated short-time withstand current 3-pole, (1s) I_{cw} [kA]	50	60	80	85	88	100	100
Rated peak withstand current 3-pole, I_{pk} [kA]	110	132	176	187	194	220	220
Max.thermal load I^2t [A^2s 10^6]	2500	3600	6400	7225	7744	10000	10000
Rated short-time withstand current 1-pole phase-N, (1s) I_{cw} [kA]	30	36	48	51	53	60	60
Rated short-time withstand current 1-pole phase-PE, (1s) I_{cw} [kA]	30	36	48	51	53	60	60
Rated peak withstand current 1-pole phase-N, I_{pk} [kA]	66	79	106	112	116	132	132
Rated peak withstand current 1-pole, phase-PE, I_{pk} [kA]	66	79	106	112	116	132	132
Effective resistance R_{20} [mΩ/m]	0.0457	0.0331	0.0223	0.0177	0.0142	0.0112	0.0089
Impedance Z_{20} [mΩ/m]	0.0495	0.0372	0.0269	0.0226	0.0173	0.0127	0.0107
Effective resistance R_1 [mΩ/m]	0.0523	0.0398	0.0277	0.0218	0.0177	0.0121	0.0108
Reactance X_1 [mΩ/m]	0.0190	0.0170	0.0150	0.0140	0.0100	0.0060	0.0060
Impedance Z_1 [mΩ/m]	0.0556	0.0433	0.0315	0.0259	0.0204	0.0135	0.0123
Resistance of entire PE conductor [mΩ/m]	0.034	0.0265	0.019	0.015	0.012	0.010	0.042
Fault loop resistance, phase-PE [mΩ/m]	0.080	0.060	0.041	0.035	0.027	0.021	0.017
Fault loop reactance, phase-PE [mΩ/m]	0.100	0.100	0.060	0.050	0.040	0.030	0.020
Fault loop impedance, phase-PE [mΩ/m]	0.128	0.117	0.073	0.061	0.048	0.037	0.026
Heat loss $3RI^2$ [W/m]	156.9	186.5	212.7	261.6	331.9	371.7	518.4
Dimensions W x H [mm]	137 x 85	137x85	137x121	137x150	137x185	137x248	137x306
Weight (IP55, IP65) [kg/m]	32.8	35.1	49.7	53.9	67.7	92.1	119
Weight when cast with casting resin (IP68) [kg/m]	34.3	36.6	51.5	56.0	70.2	96.3	123.8

6.5 Conductors aluminium, 4 bars (N, L1, L2, L3), aluminium housing

Rated current In [A]	800	1000	1250	1600	2000	2500	3200	4000
Rated insulation voltage Ui [V]	1000	1000	1000	1000	1000	1000	1000	1000
Rated operating voltage Ue [V]	1000	1000	1000	1000	1000	1000	1000	1000
Rated frequency f [Hz]	50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60
Housing	Painted RAL7035 2.5 mm thick aluminium housing							
Protection type	IP55	IP55	IP55	IP55	IP55	IP55	IP55	IP55
Conductor cross-section L1,L2,L3,N [mm²]	484	548	716	968	1258	1677	2257	2516
PE cross-section [mm² eq. Cu]	889	916	988	1097	1222	1447	1697	1808
Rated short-time withstand current 3-pole, (1s) Icw [kA]	40	50	65	80	80	90	100	115
Rated peak withstand current 3-pole, Ipk [kA]	88	110	143	176	176	198	220	253
Max. thermal load I²t [A²s 106]	1600	2500	4225	6400	6400	10000	10000	13225
Rated short-time withstand current 1-pole phase-N, (1s) Icw [kA]	24	30	39	48	48	54	60	69
Rated short-time withstand current 1-pole phase-PE, (1s) Icw [kA]	24	30	39	48	48	54	60	69
Rated peak withstand current 1-pole phase-N, Ipk [kA]	53	66	86	106	106	119	132	152
Rated peak withstand current 1-pole, phase-PE, Ipk [kA]	53	66	86	106	106	119	132	152
Resistance R20 [mΩ/m]	0.0661	0.0584	0.0447	0.0331	0.0254	0.0191	0.0142	0.0127
Impedance at 20 degrees Z20 [mΩ/m]	0.0683	0.0605	0.0471	0.0359	0.0273	0.0200	0.0150	0.0137
Resistance at thermal balance R1 [mΩ/m]	0.0700	0.0675	0.0503	0.0408	0.0324	0.0232	0.0185	0.0162
Reactance X1 [mΩ/m]	0.0170	0.0160	0.0150	0.0140	0.0100	0.0060	0.0050	0.0050
Impedance at thermal balance Z1 [mΩ/m]	0.0720	0.0694	0.0525	0.0431	0.0339	0.0239	0.0192	0.0169
Total resistance of PE conductor [mΩ/m]	0.02	0.0194	0.018	0.0162	0.0145	0.0123	0.0105	0.010
Fault loop resistance phase-PE [mΩ/m]	0.084	0.075	0.060	0.047	0.038	0.030	0.023	0.022
Fault loop reactance phase-PE [mΩ/m]	0.100	0.100	0.060	0.050	0.040	0.030	0.020	0.020
Fault loop impedance phase-PE [mΩ/m]	0.130	0.125	0.085	0.069	0.055	0.042	0.031	0.030
Heat loss 3RI² [W/m]	134.4	202.5	235.6	313.3	388.6	434.5	568.0	777.2
Dimensions W x H [mm]	137 x 85	137x95	137x121	137x160	137x205	137x286	137x376	137x416
Weight (IP55, IP65) [kg/m]	17.7	17.9	18.5	22.4	26.5	36.9	44.3	47.7

6.6 Conductors aluminium, 5 bars (N, L1, L2, L3, PE2), aluminium housing

Rated current In [A]	800	1000	1250	1600	2000	2500	3200	4000
Rated insulation voltage Ui [V]	1000	1000	1000	1000	1000	1000	1000	1000
Rated operating voltage Ue [V]	1000	1000	1000	1000	1000	1000	1000	1000
Rated frequency f [Hz]	50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60
Housing	Painted RAL7035 2.5 mm thick aluminium housing							
Protection type	IP55	IP55	IP55	IP55	IP55	IP55	IP55	IP55
Conductor cross-section L1,L2,L3,N [mm²]	484	548	716	968	1258	1677	2257	2516
Total PE cross-section [mm² eq. Cu]	1158	1221	1386	1635	1921	2379	2952	3207
Rated short-time withstand current 3-pole, (1s) Icw [kA]	40	50	65	80	80	90	100	115
Rated peak withstand current 3-pole, Ipk [kA]	88	110	143	176	176	198	220	253
Max. thermal load I²t [A²s 106]	1600	2500	5625	4225	6400	10000	10000	13225
Rated short-time withstand current 1-pole phase-N, (1s) Icw [kA]	24	30	39	48	48	54	60	69
Rated short-time withstand current 1-pole phase-PE, (1s) Icw [kA]	24	30	39	48	48	54	60	69
Rated peak withstand current 1-pole phase-N, Ipk [kA]	53	66	86	106	106	119	132	152
Rated peak withstand current 1-pole, phase-PE, Ipk [kA]	53	66	86	106	106	119	132	152
Resistance R20 [mΩ/m]	0.0661	0.0584	0.0447	0.0331	0.0254	0.0191	0.0142	0.0127
Impedance at 20 degrees Z20 [mΩ/m]	0.0683	0.0605	0.0471	0.0359	0.0273	0.0200	0.0150	0.0137
Resistance at thermal balance R1 [mΩ/m]	0.0700	0.0675	0.0503	0.0408	0.0324	0.0232	0.0185	0.0162
Reactance X1 [mΩ/m]	0.0170	0.0160	0.0150	0.0140	0.0100	0.0060	0.0050	0.0050
Impedance at thermal balance Z1 [mΩ/m]	0.0720	0.0694	0.0525	0.0431	0.0339	0.0239	0.0192	0.0169
Resistance of PE conductor [mΩ/m]	0.0154	0.0146	0.0128	0.0109	0.092	0.008	0.006	0.006
Fault loop resistance phase-PE [mΩ/m]	0.202	0.190	0.166	0.143	0.124	0.102	0.085	0.083
Fault loop reactance phase-PE [mΩ/m]	0.100	0.100	0.060	0.050	0.040	0.030	0.020	0.020
Fault loop impedance phase-PE [mΩ/m]	0.225	0.214	0.177	0.151	0.130	0.107	0.087	0.085
Heat loss 3RI² [W/m]	134.4	202.5	235.6	313.3	388.6	434.5	568.0	777.2
Dimensions W x H [mm]	137 x 85	137x95	137x121	137x160	137x205	137x286	137x376	137x416
Weight (IP55, IP65) [kg/m]	19	19,4	20,4	25	29,9	41,4	50,4	54,5

6.7 Conductors copper, 4 bars (N, L1, L2, L3), aluminium housing

Rated current In [A]	1000	1250	1600	2000	2500	3200	4000
Rated insulation voltage Ui [V]	1000	1000	1000	1000	1000	1000	1000
Rated operating voltage Ue [V]	1000	1000	1000	1000	1000	1000	1000
Rated frequency f [Hz]	50/60	50/60	50/60	50/60	50/60	50/60	50/60
Housing	Painted in RAL7035 2.5mm thick aluminium housing						
Protection type	IP55	IP55	IP55	IP55	IP55	IP55	IP55
Conductor cross-section L1,L2,L3,N [mm²]	350	484	716	903	1129	1432	1806
PE cross-section [mm² eq. Cu]	889	889	989	1069	1167	1342	1503
Rated short-time withstand current 3-pole, (1s) Icw [kA]	50	60	80	85	100	100	100
Rated peak withstand current 3-pole, Ipk [kA]	110	132	176	187	194	220	220
Max.thermal load I²t [A²s 106]	2500	3600	6400	7225	7744	10000	10000
Rated short-time withstand current 1-pole phase-N, (1s) Icw [kA]	30	36	48	51	60	60	60
Rated short-time withstand current 1-pole phase-PE, (1s) Icw [kA]	30	36	48	51	60	60	60
Rated peak withstand current 1-pole phase-N, Ipk [kA]	66	79	106	112	116	132	132
Rated peak withstand current 1-pole, phase-PE, Ipk [kA]	66	79	106	112	116	132	132
Resistance R20 [mΩ/m]	0.0457	0.0331	0.0223	0.0177	0.0142	0.0112	0.0089
Impedance at 20 degrees Z20 [mΩ/m]	0.0495	0.0372	0.0269	0.0226	0.0173	0.0127	0.0107
Resistance at thermal balance R1 [mΩ/m]	0.0523	0.0398	0.0277	0.0218	0.0177	0.0121	0.0108
Reactance X1 [mΩ/m]	0.0190	0.0170	0.0150	0.0140	0.0100	0.0060	0.0060
Impedance at thermal balance Z1 [mΩ/m]	0.0556	0.0433	0.0315	0.0259	0.0204	0.0135	0.0123
Resistance of PE conductor [mΩ/m]	0.020	0.020	0.018	0.0166	0.0152	0.0132	0.0118
Fault loop resistance, phase-PE [mΩ/m]	0.063	0.051	0.038	0.032	0.028	0.023	0.019
Fault loop reactance, phase-PE [mΩ/m]	0.100	0.100	0.060	0.050	0.040	0.030	0.020
Fault loop impedance, phase-PE [mΩ/m]	0.104	0.112	0.071	0.059	0.049	0.038	0.028
Heat loss 3RI² [W/m]	156.9	186.5	212.7	261.6	331.9	371.7	518.4
Dimensions W x H [mm]	137 x 85	137x85	137x121	137x150	137x185	137x248	137x306
Weight (IP55, IP65) [kg/m]	25.7	27.5	38.9	42.2	53.0	72.1	93.2

6.8 Conductors copper, 5 bars (N, L1, L2, L3, PE2), aluminium housing

Rated current In [A]	1000	1250	1600	2000	2500	3200	4000
Rated insulation voltage Ui [V]	1000	1000	1000	1000	1000	1000	1000
Rated operating voltage Ue [V]	1000	1000	1000	1000	1000	1000	1000
Rated frequency f [Hz]	50/60	50/60	50/60	50/60	50/60	50/60	50/60
Housing	Painted in RAL7035 2.5mm thick aluminium housing						
Protection type	IP55	IP55	IP55	IP55	IP55	IP55	IP55
Conductor cross-section L1,L2,L3,N [mm²]	350	484	716	903	1129	1432	1806
Total PE cross-section [mm² eq. Cu]	1239	1373	1705	1972	2296	2774	3309
Rated short-time withstand current 3-pole, (1s) Icw [kA]	50	60	80	85	100	100	100
Rated peak withstand current 3-pole, Ipk [kA]	110	132	176	187	194	220	220
Max.thermal load I²t [A²s 106]	2500	3600	6400	7225	7744	10000	10000
Rated short-time withstand current 1-pole phase-N, (1s) Icw [kA]	30	36	48	51	60	60	60
Rated short-time withstand current 1-pole phase-PE, (1s) Icw [kA]	30	36	48	51	60	60	60
Rated peak withstand current 1-pole phase-N, Ipk [kA]	66	79	106	112	116	132	132
Rated peak withstand current 1-pole, phase-PE, Ipk [kA]	66	79	106	112	116	132	132
Resistance R20 [mΩ/m]	0.0457	0.0331	0.0223	0.0177	0.0142	0.0112	0.0089
Impedance Z20 [mΩ/m]	0.0495	0.0372	0.0269	0.0226	0.0173	0.0127	0.0107
Resistance at thermal balance R1 [mΩ/m]	0.0523	0.0398	0.0277	0.0218	0.0177	0.0121	0.0108
Reactance X1 [mΩ/m]	0.0190	0.0170	0.0150	0.0140	0.0100	0.0060	0.0060
Impedance at thermal balance Z1 [mΩ/m]	0.0556	0.0433	0.0315	0.0259	0.0204	0.0135	0.0123
Resistance of entire PE conductor [mΩ/m]	0.014	0.012	0.010	0.009	0.007	0.006	0.005
Fault loop resistance, phase-PE [mΩ/m]	0.059	0.045	0.032	0.026	0.021	0.017	0.014
Fault loop reactance, phase-PE [mΩ/m]	0.100	0.100	0.060	0.050	0.040	0.030	0.020
Fault loop impedance, phase-PE [mΩ/m]	0.116	0.110	0.068	0.061	0.045	0.035	0.024
Heat loss 3RI² [W/m]	156.9	186.5	212.7	261.6	331.9	371.7	518.4
Dimensions W x H [mm]	137 x 85	137x85	137x121	137x150	137x185	137x248	137x306
Weight (IP55, IP65) [kg/m]	31.1	33.2	47.1	51.1	64.2	87.3	112.8

6.9 Calculating the voltage drop

ΔV = Actual current / Rated current x strand length x Factor V/m = Voltage loss
For energy distribution using tap-off units, the result must be divided by 2.

Aluminium conductors: Factor V/m according to power factors and rated current

Rated current [A]	cosφ = 0.9	cosφ = 0.8	cosφ = 0.7	cosφ = 0.6	cosφ = 0.5
800	0.099	0.094	0.087	0.080	0.073
1000	0.119	0.113	0.106	0.097	0.088
1250	0.116	0.112	0.106	0.099	0.092
1600	0.119	0.114	0.107	0.099	0.090
2000	0.116	0.111	0.105	0.097	0.088
2500	0.101	0.095	0.088	0.080	0.072
3200	0.107	0.102	0.095	0.088	0.080
4000	0.116	0.110	0.103	0.095	0.086

Copper conductors: Factor V/m according to power factors and rated current

Rated current [A]	cosφ = 0.9	cosφ = 0.8	cosφ = 0.7	cosφ = 0.6	cosφ = 0.5
1000	0.103	0.099	0.092	0.085	0.078
1250	0.094	0.091	0.087	0.081	0.075
1600	0.088	0.087	0.084	0.080	0.075
2000	0.090	0.090	0.088	0.084	0.080
2500	0.089	0.088	0.085	0.081	0.077
3200	0.074	0.073	0.070	0.066	0.062
4000	0.087	0.086	0.083	0.079	0.074

Example:

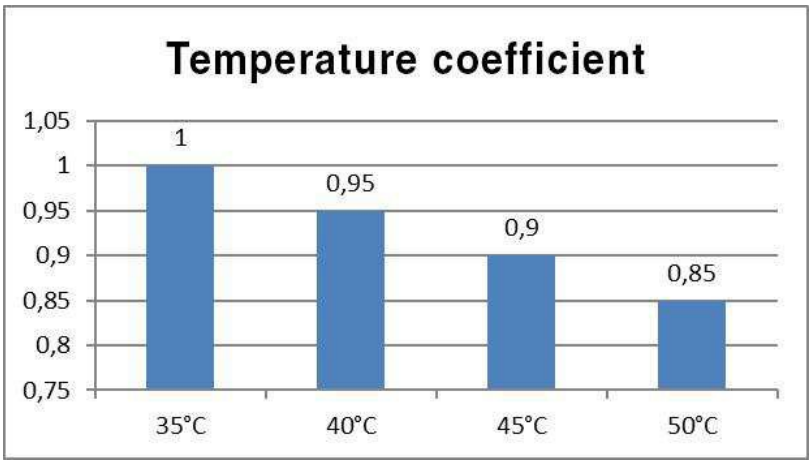
Conductor:	Copper
Actual current:	3200 A
Rated current:	4000 A
Strand length / system length:	30 m
V/m for power factor $\cos_{\varphi}$ = 0.9	0.087 (Table)

Calculation of example:

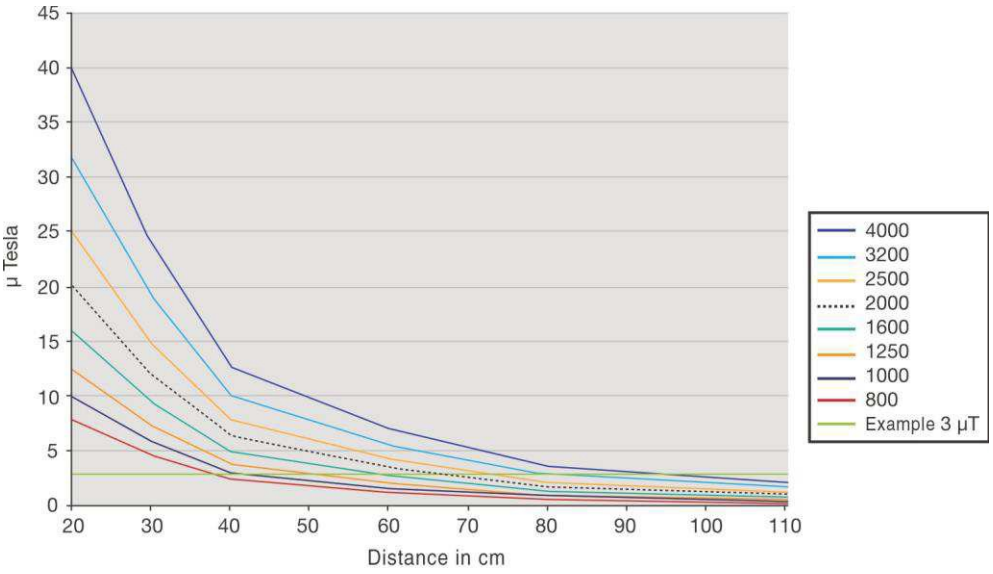
ΔV = 3200/4000 x 30 m x 0.087 V/m = 2.09 V	For energy transport
ΔV = 2.09 V/2 = 1.05 V	For energy distribution

6.10 Temperature derating

Influence of ambient temperature on the current-carrying capability of the busbars.



6.11 EMC values



Values at a distance of 1 m:

Rated current [A]	Magnetic field [µT]
800	0.6
1000	0.8
1250	0.9
1600	1.1
2000	1.4
2500	1.8
3200	2.2
4000	2.7

All details refer to aluminium busbar elements,
4 conductors (N, L1, L2, L3) and PE housing (sheet steel).

6.12 Sprinkler test

Sprinkler systems are used in buildings for fire protection. Sprinkler systems are automatic fire extinguishing systems. Their function is to detect outbreaks of fire by early detection and to extinguish them as quickly as possible by direct sprinkler irrigation.

During the extinguishing process, sprinkler irrigation of at least 30 minutes is to be assumed.

The unibar H busbar system has been subjected to a sprinkler test.

In the absence of a binding standard, the test was based on a practical test structure (see drawing in German).

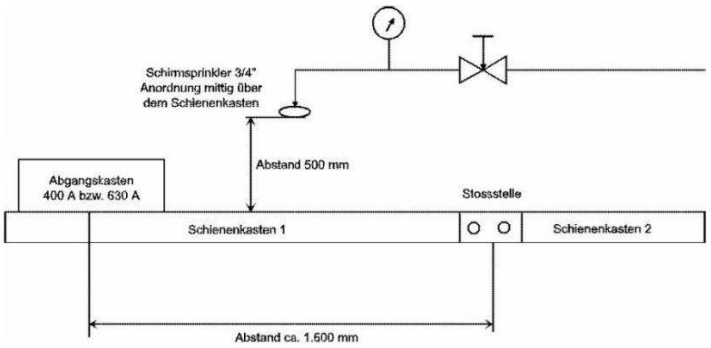
Test sequence

First, 3.5 kV/30 s AC voltage was used to test according to EN 614391, 10.9.

The busbar was then sprinkled with 300 l/min for 15 minutes, after 15 minutes another 35 minutes with 115 l/min.

Result

The final AC voltage test with 3.5 kV/30 s according to EN 614391, 10.9 was passed.



6.13 Functional endurance

Applicable regulations

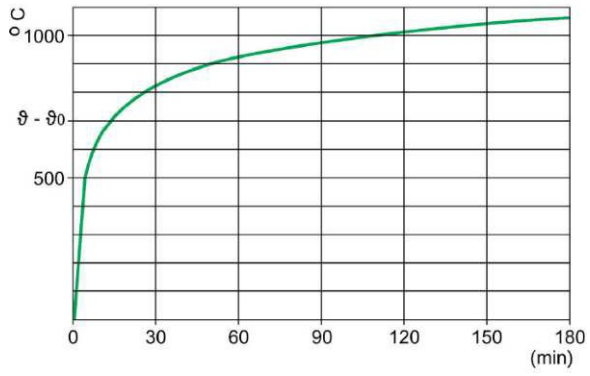
"Fire protection equipment and fire protection measures" for electrical installations are particularly necessary for structural installations of special type and use. Such structural installations include hospitals or places of public assembly. In this case the electrical installations must, according to DIN VDE 0100-560 "Structural Installations for Public Assembly" and DIN VDE 0100-710-(precursor DIN VDE 0107) "Medical Locations" or the statutory regulations of the countries, remain operational for certain times, even in the event of a fire.

This applies in particular to the following installations:

- Fire alarms
- Systems for generating alarms and giving instructions to visitors and employees
- Safety lighting
- Passenger lifts with an evacuation circuit which must remain functional for at least 30 minutes under full-fire conditions in the supply area
- Water pressure boosting systems for supplying extinguishing water
- Ventilation units for safety steps, travelling shafts and for machine rooms for firemen’s lifts for which a minimum functional capability of 90 minutes must be ensured.

In order to be able to provide the required functional maintenance for busbar trunking, testing of the unibar H rail system has been successfully carried out in collaboration with Promat, at the material testing institution in Braunschweig.

For the fire testing, various busbars with a cladding of Promatect boards in different thicknesses were tested with a fire stress from outside conforming to the standard time-temperature curve (STTC) to assess the functional maintenance in accordance with-DIN 4102-12.

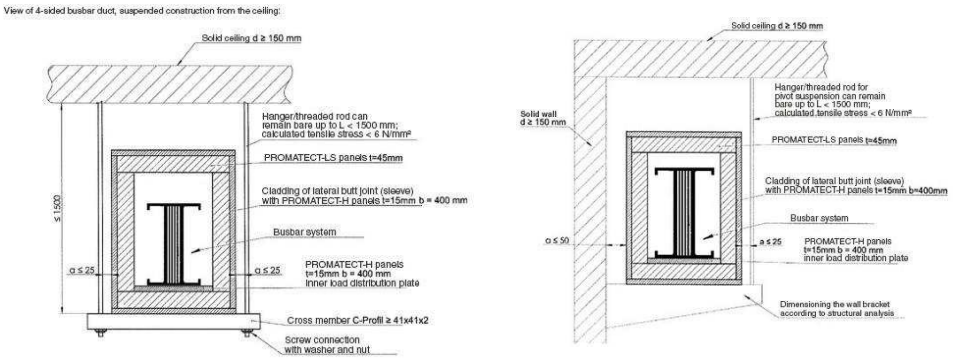


Standard Time-Temperature Curve (STTC) for assessing functional maintenance

Versions

Important elements in fulfilling functional maintenance are special components for the functional maintenance duct, as well as the support structure for the duct and the unibar H busbar trunking system. Depending on the ambient conditions, various versions of duct and support structure (fastening with threaded rods or wall brackets) are possible. The stipulations from building control test certificates must be followed and met:

- Compliance of the maximum permissible distances between the fastenings, as well as a maximum permissible tensile stress of 6 N/mm²
- Exclusive use of building control approved fastening accessories and partition material, including partition accessories. This material must be provided by the customer and is not included in the busbar trunking delivery.



Dimensions

System[1)]	Functional maintenance class	Thickness (t) [mm] of LS panels	External dimensions[2)] [mm]
KEH33S…	E15 ... E90	45 / LS	300 x 220
KEH34S…	E15 ... E90	45 / LS	300 x 240
KEH35S...	E15 ... E90	45 / LS	300 x 260
KEH36S…	E15 ... E90	45 / LS	300 x 300
KEH37S…	E15 ... E90	45 / LS	300 x 340
KEH31D…	E15 ... E90	45 / LS	300 x 420
KEH32D…	E15 ... E90	45 / LS	300 x 520
KEH33D…	E15 ... E90	45 / LS	300 x 560
KEH43S…	E15 ... E90	45 / LS	300 x 220
KEH44S...	E15 ... E90	45 / LS	300 x 220
KEH45S...	E15 ... E90	45 / LS	300 x 260
KEH46S...	E15 ... E90	45 / LS	300 x 300
KEH47S...	E15 ... E90	45 / LS	300 x 320
KEH41D...	E15 ... E90	45 / LS	300 x 390
KEH42D...	E15 ... E90	45 / LS	300 x 480

[1)] 3-sided version on request.

[2)] External dimensions apply to 4-sided versions. Installation position horizontal upright. Dimensions for 3-partition versions on request.

Reduction factors must be taken into account due to the partitions. These are available on request.

6.14 Connecting to unimes H energy distributor

Standard versions: Cabinet type U-TE, height 2000 mm

ACB type	Rail type	Operating current of busbar	Depth	Width	Position of M-BB	Connection of the busbar
AR208S	KEH33S	800	600	600	Top	Bottom
AR208S	KEH33S	800	800	600	Top	Bottom
AR208S	KEH33S	800	600	600	Bottom	Top
AR208S	KEH33S	800	800	600	Bottom	Top
AR208S	KEH34S	1000	600	600	Top	Bottom
AR208S	KEH34S	1000	800	600	Top	Bottom
AR208S	KEH34S	1000	600	600	Bottom	Top
AR208S	KEH34S	1000	800	600	Bottom	Top
AR208S	KEH35S	1250	600	600	Top	Bottom
AR208S	KEH35S	1250	800	600	Top	Bottom
AR208S	KEH35S	1250	600	600	Bottom	Top
AR208S	KEH35S	1250	800	600	Bottom	Top
AR212S	KEH35S	1250	600	600	Top	Bottom
AR212S	KEH35S	1250	800	600	Top	Bottom
AR212S	KEH35S	1250	600	600	Bottom	Top
AR212S	KEH35S	1250	800	600	Bottom	Top
AR212S	KEH36S	1600	600	600	Top	Bottom
AR212S	KEH36S	1600	800	600	Top	Bottom
AR212S	KEH36S	1600	600	600	Bottom	Top
AR212S	KEH36S	1600	800	600	Bottom	Top
AR216S	KEH36S	1600	600	600	Top	Bottom
AR216S	KEH36S	1600	800	600	Top	Bottom
AR216S	KEH36S	1600	600	600	Bottom	Top
AR216S	KEH36S	1600	800	600	Bottom	Top
AR216S	KEH37S	2000	600	600	Top	Bottom
AR216S	KEH37S	2000	800	600	Top	Bottom
AR216S	KEH37S	2000	600	600	Bottom	Top
AR216S	KEH37S	2000	800	600	Bottom	Top
AR220S	KEH37S	2000	600	600	Top	Bottom
AR220S	KEH37S	2000	800	600	Top	Bottom
AR220S	KEH37S	2000	600	600	Bottom	Top
AR220S	KEH37S	2000	800	600	Bottom	Top
AR220S	KEH31D	2500	600	600	Top	Bottom
AR220S	KEH31D	2500	800	600	Top	Bottom
AR220S	KEH31D	2500	600	600	Bottom	Top
AR220S	KEH31D	2500	800	600	Bottom	Top
AR325S	KEH31D	2500	600	600	Top	Bottom
AR325S	KEH31D	2500	800	600	Top	Bottom

ACB type	Rail type	Operating current of busbar	Depth	Width	Position of M-BB	Connection of the busbar
AR325S	KEH31D	2500	800	600	Bottom	Top
AR325S	KEH32D	3200	800	600	Top	Bottom
AR325S	KEH32D	3200	800	600	Bottom	Top
AR332S	KEH32D	3200	800	800	Top	Bottom
AR332S	KEH32D	3200	800	800	Bottom	Top
AR332S	KEH33D	4000	600	800	Top	Bottom
AR332S	KEH33D	4000	800	800	Top	Bottom
AR332S	KEH33D	4000	600	800	Bottom	Top
AR332S	KEH33D	4000	800	800	Bottom	Top
AR440S	KEH33D	4000	800	1000	Top	Bottom
AR440S	KEH33D	4000	800	1000	Bottom	Top

- Connections also available for cabinet types U-TE with a height of 2200 mm.
- All in-feed switches are available as 3-pole or 4-pole.

7 Installation, handling and maintenance

7.1 For your safety

- Take note of the assembly instructions before starting assembly, installation or other work on the BTS busbar trunking system.

7.1.1 Intended use

The unibar H busbar system is used to set up fixed, enclosed busbar trunking systems, BTS

- for energy transport between the transformer station and the low voltage main distribution board (LVMD)
- for energy transport between low voltage main distribution boards (LVMD)
- for energy transport between low voltage main distribution boards (LVMD) and low voltage sub distribution boards (LVSD)
- for energy distribution by extending as a line distributor / switchgear combination system by fitting tap-off units (only for busbar elements with protection type IP55 / IP65)

Design variants

The unibar H busbar system is available in various IP protection type versions:

- unibar H with protection type IP55 / IP65
- unibar H with protection type IP68 (cast resin system)

The busbar elements for the busbar system are available in different versions

- with inner aluminium conductors and steel housing,
- with inner copper conductors and steel housing,
- each in 4-pole versions with N, L1, L2, L3 conductors and the steel housing serving as the PE protective conductor,
- each in 5-pole versions with N, L1, L2, L3 conductors and the steel housing serving as the PE protective conductor and an additional internal conductor serving as PE2,
- aluminium housings are available on request.

Busbar elements with different geometric shapes and a different position of the N conductor are available.

The busbar system can be routed horizontally or vertically in installation position. The inner conductors can be installed in the upright or flat position. When installed flat and horizontally, the N conductor is positioned at the bottom.

The unibar H busbar system with protection type IP68 (cast resin system) is used exclusively for transporting electrical energy over busbar trunking runs without tap-off units.

The unibar H busbar system with protection type IP55 / IP65

- is used for transporting electrical energy,
- can be fitted with tap-off units at predefined plug-in for extracting electrical energy,
- can be fitted with feed boxes,
- can be combined with busbar elements of protection type IP68 (cast resin system, exclusively for energy transport), even in one strand course.

Meets EN 61439-1/-6

The unibar H busbar systems are manufactured in accordance with EN 61439-1/-6. The connection is type tested up to 4000 A on the Hager unimes H energy distribution system. Switchgear combinations conforming to EN 61439-1/-2 are constructed from the system proposal for the unimes H energy distribution system.

The rated diversity factor complies with EN 61439-6, 5.4. Intended use includes observing the Technical Data.

The unibar H busbar system is used to construct project-specific busbar trunking systems, BTS:

The planning of the individual BTS is undertaken by Hager in accordance with the user's specifications. The assembly of the busbar elements is carried out by Hager or Hager-licensed switchgear manufacturers. The initial operation is carried out at the user's site by an electrical specialist with testing experience. Servicing and operation by an unqualified person are not permitted.

The use of the busbar system as part of a machine is not considered to be intended use. The unibar H busbar system is not intended for constructing BTS that are specifically intended for the electrical equipment of machinery.

Misuse:

Any use other than or beyond that specified, as well as modifications to the components and busbar elements that are not designated in the system proposal are considered to be incorrect use. Hager does not assume any liability for damages resulting from misuse.

Misuse of the unibar H busbar system includes, for example

- misuse of the BTS as a walkway, working platform, shelf or fastening for objects that do not belong to the BTS,
- misuse of BTS elements as fastening for other trunking or for frames,
- unauthorised drilling or welding on busbar elements or energy distribution elements of the BTS,
- the removal of flanges / covers and their screw fastenings or the removal of components necessary for safe operation.

7.1.2 Requirements for authorised personnel

	- Only qualified electrically skilled persons may install, commission, service or carry out expansions to the busbar trunking system BTS. - Only electrically skilled persons with testing experience may commission the busbar trunking system.
	Electrically instructed persons may undertake assembly activities under the supervision of a qualified electrical specialist - Fastening hanger assemblies / supporting system - Fastening busbar elements - Connecting busbar elements (strand disconnected)

Product life cycle phase	Minimum training, qualification or competence
Planning	Electrically skilled persons, carried out by Hager in coordination with the user.
Transport	Transport specialist personnel
Assembly, installation	Hager or a switchgear manufacturer licensed by Hager, electrically skilled persons / for clearly defined mechanical and electrical work: electrically instructed person (under supervision of electrically skilled person)
Commissioning	Electrically skilled person with testing experience, user-provided
Inspections	Electrically sikkeld person with testing experience, user-provided
Expansions	Planning required Electrically skilled persons; for clearly defined mechanical and electrical work only: instructed personnel (under supervision of electrically skilled person)

Qualified electrically skilled person

As a result of his technical training, knowledge and experience, as well as knowledge of the relevant regulations, an electrically skilled person can assess the work assigned to him and recognise potential dangers.

To supervise the assembly and to undertake installation activities, the qualified electrically skilled person must

- be experienced in the construction of industrial electrical components,
- have specific training in this field.

7.1.3 Observe the assembly instructions

Read and follow the assembly instructions for the unibar H busbar system.

In the assembly instructions you will find safety-related information on transport, storage, assembly, operation, inspection and finally the disposal of system components.

- Adherence to the safety information in the assembly instructions is a precondition for the safe assembly and use of the busbar system.
- Only the principles of use of system components are described in this system manual.

7.2 Transport and storage

7.2.1 Lifting busbar elements

The following must be avoided when transporting busbar elements

- Damage to the busbar elements, particularly at the ends,
- Damage to the painting.

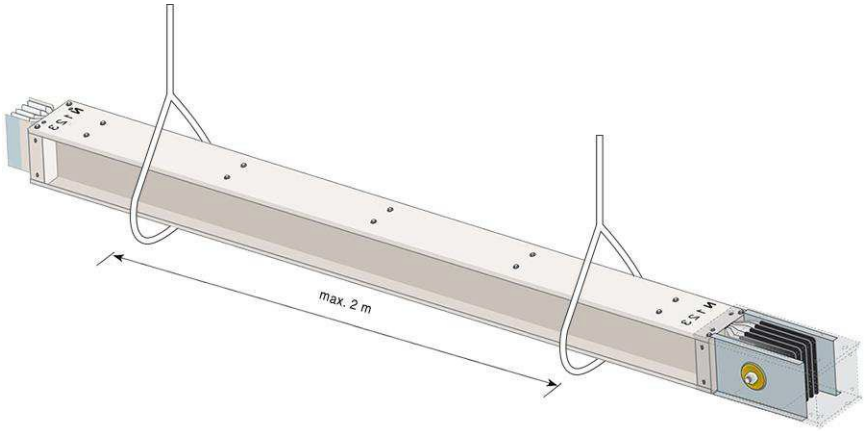
Transport is always carried out in the horizontal plane, lying flat.

The busbars and busbar elements can be lifted

- manually (weight-dependent),
- using non-metallic slings,
- using lifting devices such as forklifts, if the busbar elements are secured on wooden pallets or are packed in wooden crates.

Lifting with slings

- using non-metallic slings on each element



Lifting with slings
Maximum spacing of the slings: 2 m

- The distance between the two lifting points must be no greater than 2 m. The two lifting points must not be at the ends of the busbar / busbar element.

Lifting devices

- When transporting with lifting devices such as forklifts, pallet trucks or roller devices, take care that busbar elements are secured on wooden pallets or are packed in wooden crates.
- Mechanical hoists can only be used if the lifting points on busbar elements are packed inside wooden crates or are made when secured on wooden pallets.

7.2.2 Storage

Horizontal storage, protected at room temperature

- Straight busbar elements must be stacked horizontally on one another. A maximum of 5 straight busbar elements may be laid on one another.
- All unibar components must be stored in a dry, clean and dust-free environment at room temperature before they are installed. Larger temperature fluctuations may cause condensation and thus damage the insulation.
- All specifications for protection types refer only to products which have been stored and installed correctly.

7.3 Assembling the unibar H system

The fastening spacing is 3 m for the upright installation position and 2 m for the flat installation position. For double systems (in aluminium rails from 2500 A, identifier "D") the fastening spacing is always 2 m.

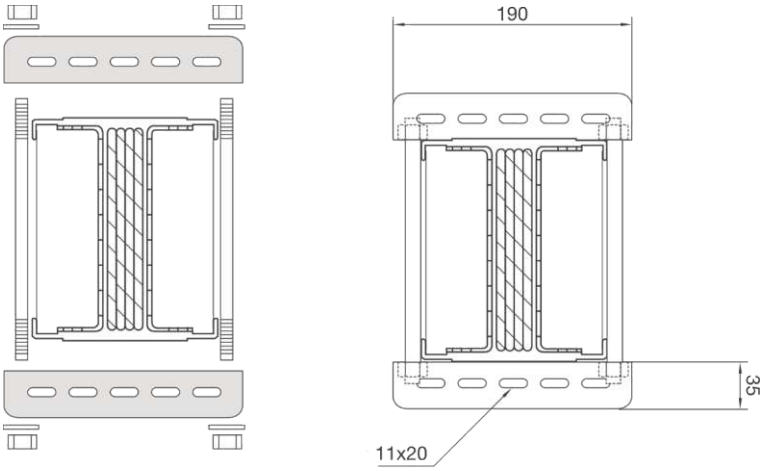
If straight busbar elements are installed in the horizontal direction with the conductors flat, the neutral conductor must be in the lower position. Since the busbar element is otherwise position-independent, there is no derating for vertical installation.

- Follow the installation drawing and the numbered, marked sequence.
- busbar elements, connection joints and feeder units are installed and disassembled with no voltage applies as a matter of principle (disconnected and secured from being switched on again).

7.3.1 Hangers

To hang the straight busbar elements, two by two standard hangers are fitted to the elements with the following distances:

Direction	Installation position	Distance between the hangers
Horizontal	Flat	2 m for straight busbar elements - For single body - For Double body systems (from 2500 A up to 4000 A)
Horizontal	Upright	- 3 m for straight busbar elements with single body (< 2500 A for aluminium, < 3200 A for copper inner conductors) - 2 m for straight busbar elements with double body systems (from 2500 A for aluminium / 3200 A for copper inner conductors)
Vertical	Flat	2 m for straight single and double bodies
Vertical	Upright	2 m for straight single and double bodies



A profile rail from the standard hanger can be replaced by a bracket (e. g., KTAS System from Niedax). As a result, a change to the size of the threaded rods (standard M10) depending on the hole size of the bracket used (for KTAS: M8) may be necessary.

7.3.2 Mounting direction and installation position

Direction / mounting direction

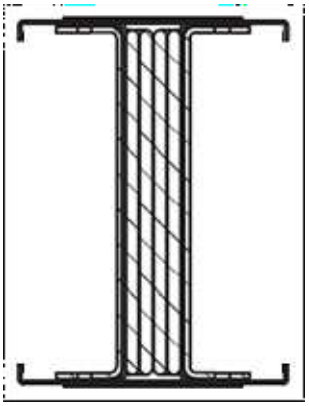
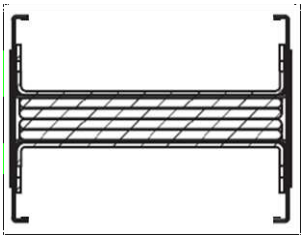
The direction describes the direction in which the busbars are mounted: horizontal or vertical.

Horizontal direction	Vertical direction
	

- Changes of direction are implemented with standardized system components such as change directions, Z-elements and T-elements.

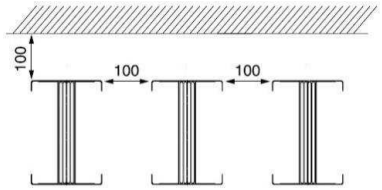
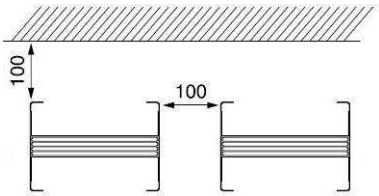
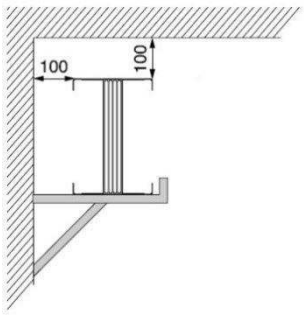
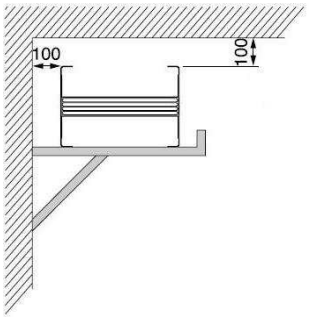
Installation position

The installation position describes how the inner conductors are mounted inside the busbar: upright or flat.

Upright installation position	Flat installation position
	
View from front in horizontal direction	View from front in horizontal direction
- Width of busbar 137 mm - Height depends on rated current I_n	- With a horizontal installation direction and a flat installation position, the N conductor must be at the bottom

Wall and ceiling distances

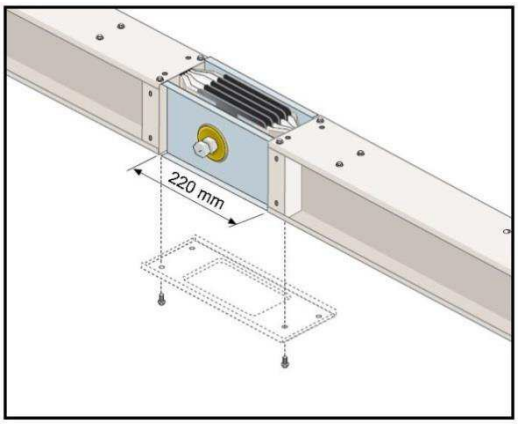
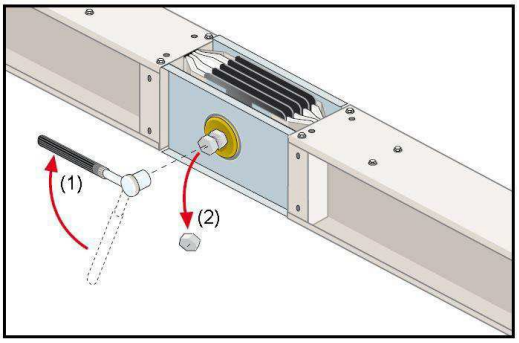
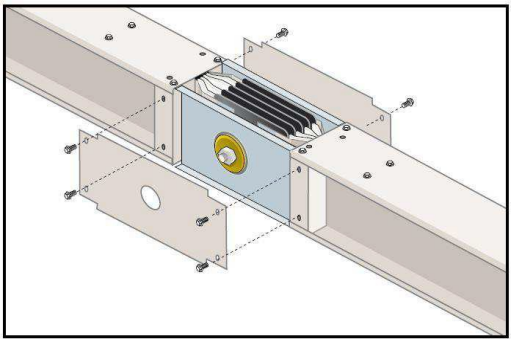
The specified distances must be observed in order to enable the assembly of the system and to enable adequate heat removal.

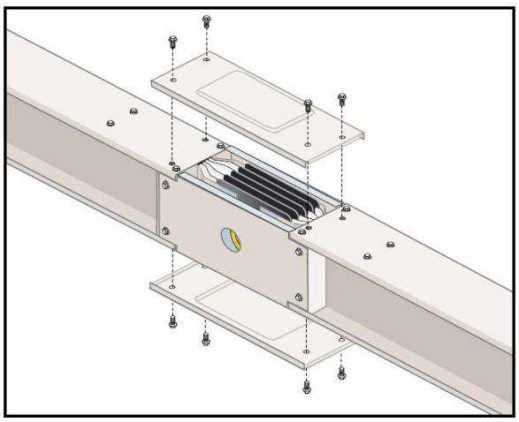
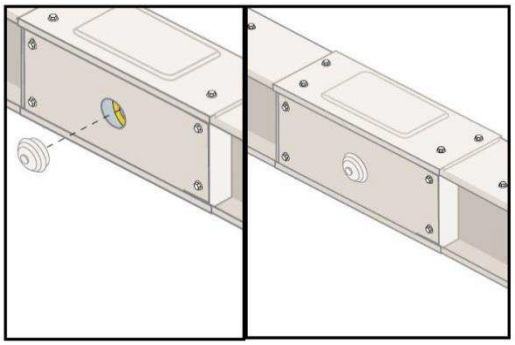
Wall and ceiling distances Upright installation position	Wall and ceiling distances Flat installation position
	
	

All dimensions in mm.

When tap-off units are used, the dimensions must be changed accordingly.

7.3.3 Assembly principle for connection joints with protection type IP55/IP65

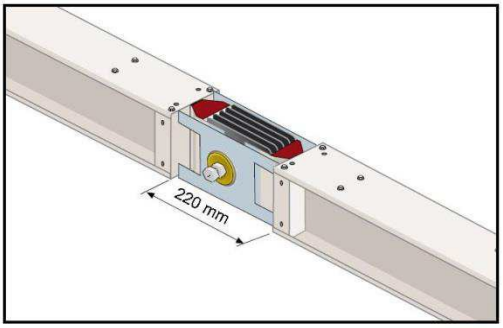
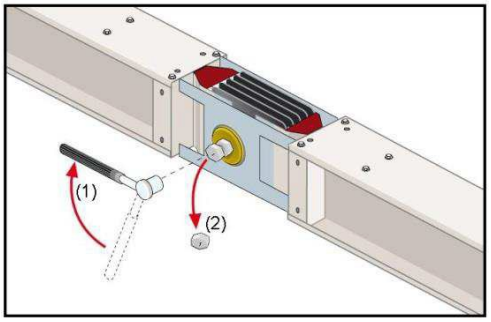
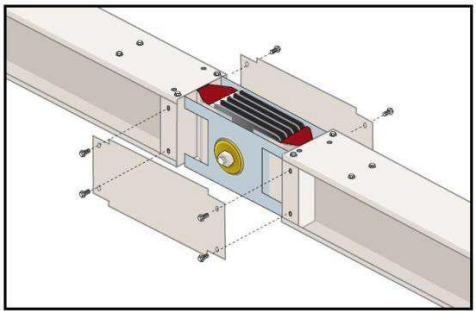
Step	Action
1	Remove the two transport protection steel plates at the end of the busbar / busbar element (on the non-jointed side) and dispose of them.
2	Remove the 4 covers for the joint block (flanges of the joint block).
3	Before connecting, make sure that the ends of the busbar elements and the joint block are clean and undamaged.
4	Insert the ends of the busbar elements carefully into the joint block.
5	Push the two busbar elements together so that the distance is 220 mm. Take care that the inner conductors in the joint block are all aligned evenly. 
6	Tighten the shear-off bolt on the single bolt clamp(s) until the double-headed bolt shears off. This occurs at approximately 60 Nm. 
7	Fit the side flanges. 

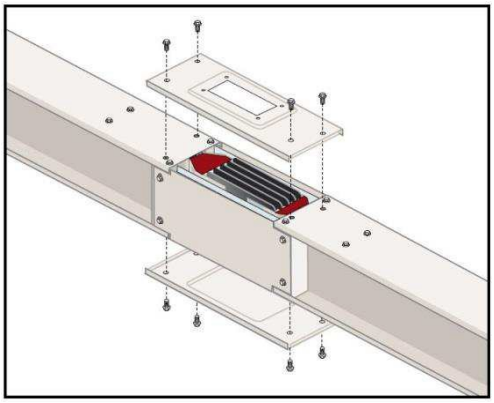
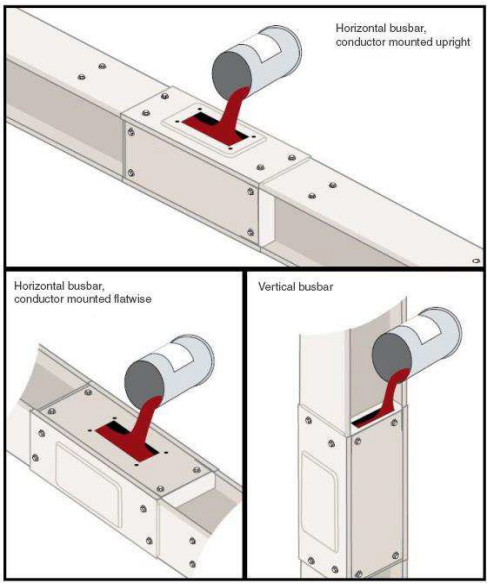
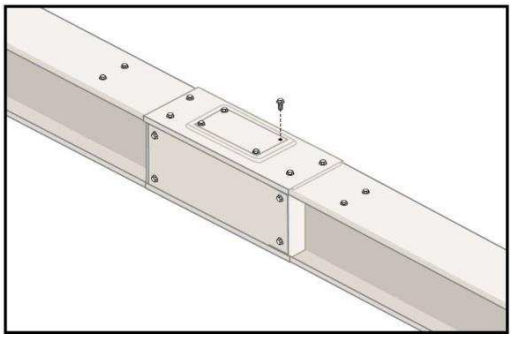
Step	Action
8	Fit the top and bottom flanges. 
9	Tighten all the bolts.
10	Seal the bolt hole with the cap. Result: The connection has been made. 

- Observe the assembly instructions for safe assembly.

It is not permissible to fit a fire barrier over a joint block.

7.3.4 Assembly principle for connection joints with protection type IP68

Step	Action
1	Remove the two transport protection steel plates at the end of the busbar elements (on the non-jointed side) and dispose of them.
2	Remove the 4 covers for the joint block (flanges of the joint block).
3	Before connecting, make sure that the ends of the busbar elements and the joint block are clean and undamaged.
4	Insert the ends of the busbar elements carefully into the joint block.
5	Push the two elements together so that the distance is 220 mm. Take care that the inner conductors in the joint block are all aligned evenly. 
6	Tighten the shear-off bolt on the single bolt clamp until the double-headed bolt shears off. This occurs at approximately 60 Nm. 
7	Check the insulation resistance. It will not be possible to perform this check after filling with the casting resin mixture.
8	Fit the side flanges. 

Step	Action
9	Fit the top and bottom flanges. 
10	Tighten all the bolts.
11	Insert the seals.
12	Prepare the casting resin mixture according to the instructions and then fill the joint block. 
13	Seal the filling hole with the cover. Result: The connection has been made. 

- Observe the assembly instructions for safe assembly.

It is not permissible to fit a fire barrier over a joint block.

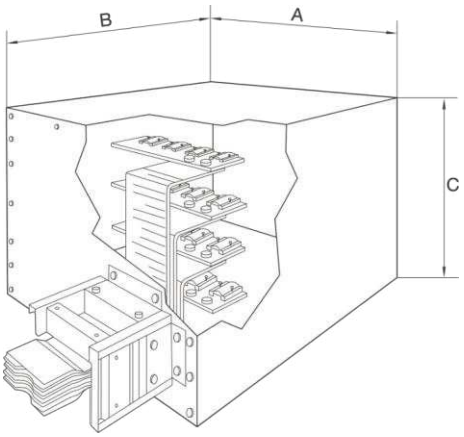
7.3.5 Cable feeds

- The installation of feeder units requires the busbar trunking run to be free of applied voltage (disconnected and secured from being switched on again).

Cable end feeder

The cable end feeder is supplied complete with joint block.

Assembly is carried out according to the principle of assembly of connection joints.

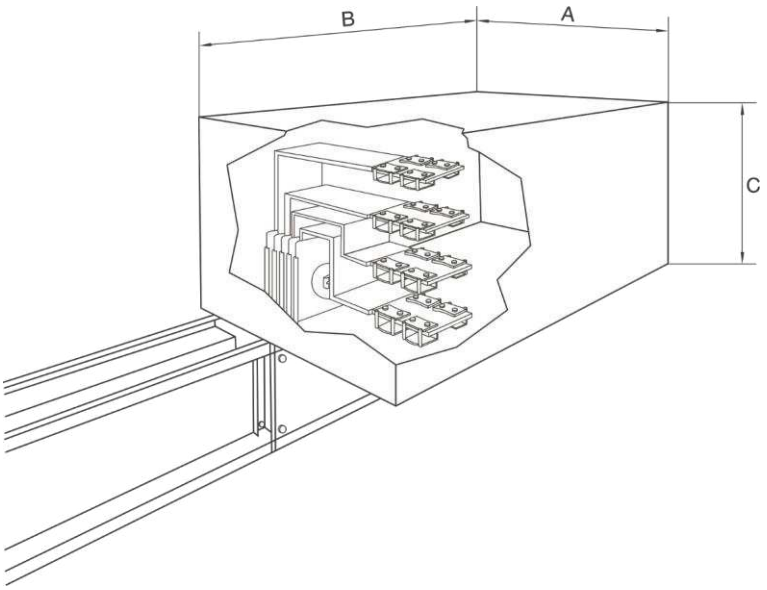


Cable intermediate feeder

The cable intermediate feeder can only be installed at the connection joint between two adjacent straight busbar elements.

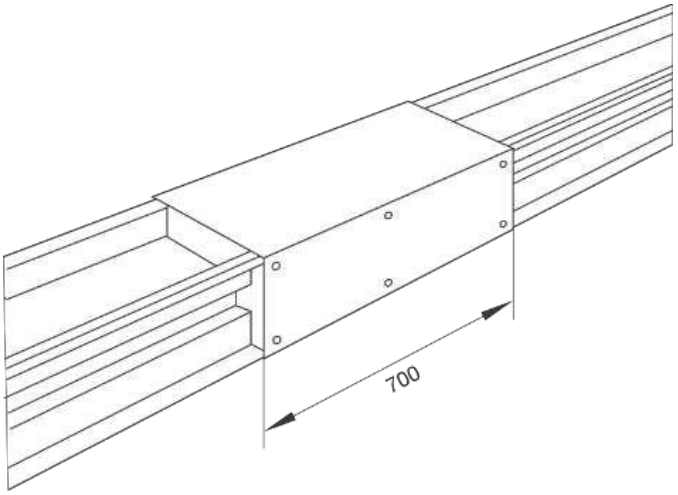
The cable intermediate feeder is supplied complete with joint block.

The supplied joint block (with special clamping block) replaces the standard joint block that may be present. The standard joint block between the adjacent straight busbar elements is exchanged.



7.3.6 Fire barrier

Fire barriers are required for busbar elements which pass through fire area.
They are fitted to the busbar element during the manufacturing process.

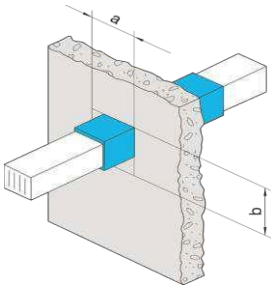


Comment:

- After assembling the busbar run, seal the joints in the fire barrier or fire ceiling with dimensionally stable, non-flammable construction material (Class A1 or A2-s1; d0 conforming to EN 13501--1) completely to component thickness, e. g., with concrete or grout. The concrete or grout must meet the applicable regulations to preserve the fire resistance classification of the wall or ceiling, e. g., EN 206--1 and EN 998--2.
- Make sure that, in the case of large wall or ceiling penetrations, e.g., through reinforcements or steel brackets, the fasteners are secured from slipping out.

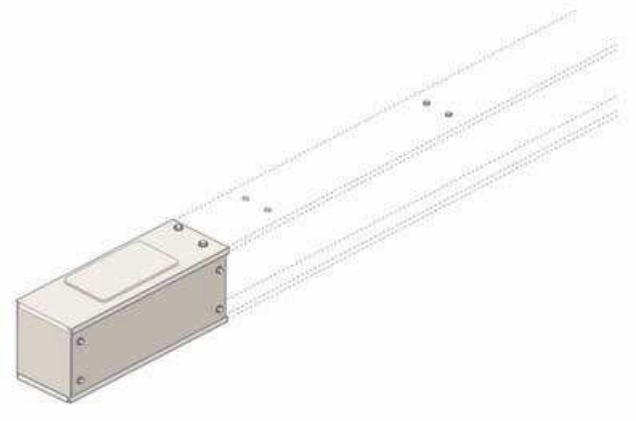
Dimensions of the penetrations
The following dimensions are specified for penetrations:

System	a [mm]	b [mm]
KEH33S* - 800 A	350	350
KEH34S* - 1000 A	350	350
KEH35S* - 1250 A	350	400
KEH36S* - 1600 A	350	400
KEH37S* - 2000 A	350	450
KEH31D* - 2500 A	350	550
KEH32D* - 3200 A	350	650
KEH33D* - 4000 A	350	650



7.3.7 End flange

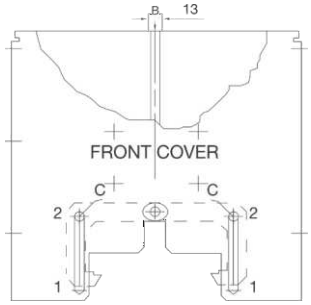
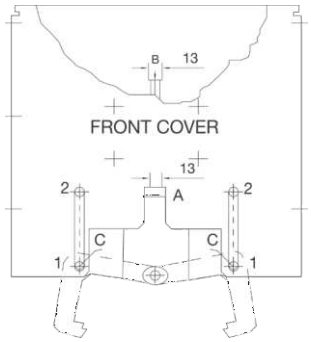
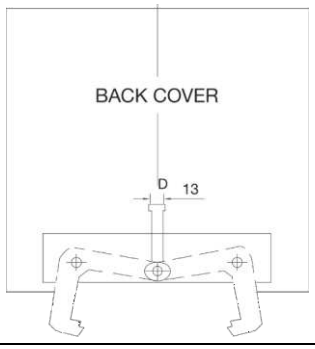
End flanges are used to cap busbar elements at the end of a run safely. End flanges are fastened with bolts.

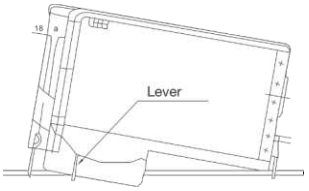


7.3.8 Fitting tap-off units to plug-in (125 - 630 A)

The installation of units for plug-in is only possible on straight busbar elements with plug-in.

- These tap-off units can be installed without switching off the busbar trunking run. The measures for live working according to EN 50110 (VDE 0105-1) and national regulations and standards must be observed for this (national regulations may also prohibit live assembly).
- The tap-off units are plugged onto the plug-in and clamped to the straight busbar element.
- Due to the large connection compartment, the maximum rated current is restricted according to the number of plug-in on the busbar elements
  - to a maximum of 250 A for 3 plug-in,
  - to 630 A for 2 plug-in,

Step	Action
1	Open the cover of the tap-off unit. Result: Screw B is accessible. 
2	Turn screw B until screws C have moved from position 2 to position 1 and the front clamps have opened. 
3	Turn screw D until the rear clamps have opened. 
4	Place the tap-off unit on the plug-in provided on the straight busbar element.

Step	Action
5	Align the position lever (Lever). 
6	Unfasten screw D until the rear clamps have closed.
7	Unfasten screw B until screws C have moved from position 1 to position 2 and the front clamps have closed.

7.3.9 Fitting tap-off units to connection joints (250 - 1250 A)

Tap-off units can only be installed on connection joints between straight busbar elements.

- Installing a tap-off unit requires the power to be disconnected from the busbar trunking run (disconnected and secured from being switched on again).
- A joint block for tap-off units (with a special joint block), available as an accessory, is installed. The standard joint block for connection joints between adjacent busbar elements is exchanged.

Step	Action
1	Remove the covers / flanges on the intended connection joint.
2	Remove the standard joint block.
3	Insert the supplied special joint block for tap-off units into the connection joint.
4	Open the cover of the tap-off unit.
5	Remove the cover inside the tap-off unit.
6	Place the tap-off unit on the joint block. Result: The joint block slides into the tap-off unit.
7	Use a spanner to close the clamps at the side until the screws have turned anti-clockwise by 90°.
8	Insert the two side bars of the joint block connecting bar into the connection joint.
9	Insert the two centre bars of the joint block connecting bar into the connection joint.
10	Screw the bars to the outlets of an MCCB or isolator.
11	Insert the cover in the tap-off unit.
12	Tighten the joint block up to 60 Nm.
13	Screw on the covers for the connection joint.
14	Close the cover on the tap-off unit.

7.4 Operation, maintenance and enlargement

- Extensive information can be found in the assembly instructions.
- The initial operation after assembly and installation of the busbar trunking elements is carried out at the user's site by an electrically skilled person with testing experience. It includes
  - An initial check with visual inspection for completeness
  - A check of mechanical condition
  - Continuity check of protective conductor circuit (< 0.1 ohm)
  - Measurement of voltage drop
  - The units may not be serviced or operated by an unqualified person.

7.4.1 Maintenance

Maintenance free

The unibar H busbar system is maintenance free, provided the following conditions are met:

- The assembly has been carried out in accordance with the assembly instructions.
- A recorded insulation measurement and a visual inspection were carried out after the assembly.
- The commissioning was carried out properly.
- The busbar is free from
  - Mechanical stress and external forces,
  - Impairments due to foreign objects, dust, liquids,
  - Exposure to aggressive media (e. g., acids),
  - Vibrations,
  - Other incident-related stresses caused by short circuits, fire or evolution of gas.

Maintenance free does not refer to devices that are used in tap-off units, feeder units and coupling boxes. The checking and maintenance of these devices must be carried out in accordance with the relevant product information.

Inspections and checks by an electrical specialist are required,

- under special operating conditions or ambient conditions,
- in the event of special circumstances, such as moisture, condensation, water entering the surroundings of the busbar trunking system, contamination or vibrations,
- in the event of mechanical damage caused, for example, by work in the vicinity of the busbar trunking system.

The variant of the unibar H busbar system with protection type IP55/IP65 provides the option of checking the tightening torque of the bolts in the joint blocks at any time. Checking and, if necessary, retightening can be carried out without switching off the busbar trunking run. When doing this, observe the measures for live working according to EN 50110 (VDE 0105--1) and national regulations and standards.

Recommended intervals for recurring checks / visual inspection

Recurring checks do not require the unibar H busbar trunking system to be switched off.

In the interest of ensuring a high level of operational safety, the busbar trunking system should be checked every 4 years by an electrically skilled person with testing experience and verified that it is in perfect working order (recommendation by German Social Accident Insurance regulation 3 (DGUV) (formerly BGV A3)). National or insurer regulations may extend or shorten the test interval.

The recommended checks include an exterior visual inspection:

- Condition of the supporting system, hangers and fastenings,
- Busbar trunking system for completeness (flanges and their bolted connections, covers, closed caps on tap-off units),
- Mechanical condition, paint damage, damage to tap-off units,
- Signs of corrosion,
- Legibility of name plates, clean if necessary,
- Check of ambient conditions (room temperature, relative humidity, aggressive air constituents, dust).

7.4.2 Enlargement

Modifications and enlargements with unibar H components are possible at any time after the installation of the busbar trunking system.

Planning an enlargement of the installation or the replacement of components

- Prior to replacing electrical equipment with other types of devices and also prior to expanding the system, a new project must be planned and the busbar trunking system must be tested according to EN 61439.
- When expanding or modifying an existing system, it must be verified and confirmed that the safety of the existing system is not adversely affected.
- After enlargements, modifications, retrofitting and repairs, an initial test of the busbar trunking system must be performed.
- If the replacement of the equipment involves changes that are not included in the design verifications of the original manufacturer Hager, a design verification must be created. A routine verification is not sufficient in this case. Use only type-tested components from Hager. In this way you will avoid the need to create a type verification.

8 Comments for specifications for tenders

Basic description of busbar trunking systems 800 - 4000 A

Busbar trunking system must be supplied and fitted as a low voltage switchgear combination conforming to IEC / EN 61439-1 and IEC / EN 61439-6 in a ready-to-connect implementation.

The following descriptions are integral parts of the quotation and contract. They must be taken into account in the descriptions of the individual installations and equipment, even if they are not mentioned in any further detail.

The busbar trunking must be suitable:

- For energy transport
- For energy distribution as a wide area supply with protection type IP55/IP65
- For horizontal and vertical installation without reduction in current-carrying capability

The busbar trunking system must consist of standardized system building blocks, e. g.:

- Straight busbar elements / busbar boxes with and without plug-in
- Feeder units for transformer, distributor and cable feeders
- Changes of direction such as elbows, knees, Z-elements, T-elements, etc.
- Tap-off units (not with protection type IP68)
- Accessories

All straight busbar elements are available ex-factory in lengths up to a maximum of 3 m. Flexible changes of direction and changes of direction implemented as cable connections are not permitted.

If required, it must be possible to equip the busbar trunking system with an asbestos-free fire barrier tested to EN 1366-3 for wall or ceiling penetrations, which optionally meets fire resistance class EI90 or EI120 according to EN 13501.

The housing consists of painted steel sheet (e.g., RAL 7035).

The individual system elements are connected by using a current state-of-the-art single bolt clamp. The torque of approx. 60 Nm required for the clamped connection must be indicated by the outer part of the shear-off bolt shearing off.

The busbar bars must be made of aluminium or copper and be insulated over their entire length. Aluminium conductors are coated over their entire length with zinc, copper and tin. The insulation coating consists of an F-class polyester tape.

The bar cross-sections must not be less than the values specified in the technical data.

Bars of double body systems for the same phase have balanced at each connection joint to ensure equal current distribution. Special components for phase compensation are not permitted.

Heat is dissipated by the housing. The temperature rise of the housing at the particular rated current must not exceed 55 °, regardless of the installation position.

The busbar system must ensure protection type IP55 / IP65. It must be possible to use the same busbar system to implement protection type IP68 for energy transport, even within one busbar run. Busbar elements with protection type IP68 are also built using sandwich construction and are then filled with casting resin.

The manufacturer of the busbar system must maintain and demonstrate a certified quality management system conforming to EN ISO 9001.

The following qualifications for the entire system must be verified by certificates or declarations of conformity:

- IEC / EN 61439-1 and -6
- Fire protection, tested to EN 1366-3
- Silicone and halogen free
- Sprinkler test
- Functional endurance (on demand)

Special, additional properties of system components must be positively verified.

Technical data for the busbar elements

Standards:	IEC / EN 61439-1 and IEC / EN 61439-6
Construction:	Compact system (sandwich)
Ambient temperature: min. / max. / 24-hour average for any installation position	-5 / +35 /+35 °C
Protection type:	IP55 / IP65 / IP68
Torque:	Approx. 60 Nm
Surface of aluminium rails:	insulated over the entire length, galvanised, copper-plated and tinned
Housing material:	Sheet steel
Colour:	RAL 7035
Rated insulation voltage U_i:	1000 V_{AC}
Rated operating voltage U_e:	1000 V_{AC}

9 Formula characters and abbreviations in accordance with EN 61439-1/-6

Important formula characters first mentioned in EN 61439-1/-6*

Abbreviation	Description	Standard section 61439-1/-6* (initial mention)
CTI	Comparative figure of tracking	EN 61439-1, 03/06/2016
ELV	Low voltage	EN 61439-1, 03/07/2011
EMC	Electromagnetic compatibility	EN 61439-1, 3.8.13
f_n	Rated frequency	EN 61439-1, 03/08/2012
I_c	Short-circuit current	EN 61439-1, 3.8.6
I_{cc}	Conditional short-circuit current	EN 61439-1, 3.8.10.4
I_{cp}	Prospective short-circuit current	EN 61439-1, 3.8.7
I_{cw}	Rated short-time withstand current	EN 61439-1, 3.8.9.3
I_n	Rated current	EN 61439-1, 3.8.10.1
I_{nA}	Rated current of a switchgear combination / BTS	EN 61439-1, 5.3.1, Supplement in EN 61439-6, 5.3.1
I_{nc}	Rated current of a circuit	EN 61439-1, 5.3.2, Supplement in EN 61439-6, 5.3.2
I_{pk}	Rated peak withstand current	EN 61439-1, 3.8.10.2
N	Neutral conductor	EN 61439-1, 3.7.5
PE	Protective conductor	EN 61439-1, 3.7.4
PEN	PE/N conductor, PEN conductor	EN 61439-1, 3.7.6
RDF	Rated diversity factor	EN 61439-1, 3.8.11 / 5.4 Replacement in EN 61439-6, 5.4
SCPD	Short-circuit protective device	EN 61439-1, 03/01/2011
SPD	Surge protective device	EN 61439-1, 03/06/2012
U_e	Rated operational voltage	EN 61439-1, 3.8.9.2
U_i	Rated insulation voltage	EN 61439-1, 3.8.9.3
U_{imp}	Rated impulse withstand voltage rated peak withstand current	EN 61439-1, 3.8.9.4 / 5.2.4 Replacement of comments in EN 61439-6, 5.2.4
U_n	Rated voltage	EN 61439-1, 3.8.9.1
k_{1A}	Temperature factor of the BTS	EN 61439-6, 5.3.1
k_{1c}	Temperature factor of a circuit	EN 61439-6, 5.3.2
k_{2c}	Assembly factor of a circuit	EN 61439-6, 5.3.2
R, X, Z	Outer conductor and fault circuit characteristics	EN 61439-6, 5.101

*According to the low-voltage directive and the EMC directive, EN 61439-1 does not provide a presumption of conformity without another part of the standard being applied:

To achieve a presumption of conformity for busbar trunking systems BTS (busways), at least EN 61439-1 and EN 61439-6 (Part 1 and Part 6 of the standard EN 61439) must be applied.

10 Glossary

Busbar elements

Busbar trunking unit BTU.
Busbar trunking units / busbar elements can take various geometric shapes, such as, for example

- Straight length: straight busbar element
- Change directions
- T-elements

Busbar trunking run / BTR

If a busbar trunking system BTS consists of connected busbar trunking units, one speaks of a busbar trunking run.

Busbar trunking system BTS

(BTS: busbar trunking system). A bus trunking system BTS is used according to EN 61439-6 as a self-contained switchgear combination for distributing and controlling electrical energy

- for all types of loads,
- for industrial, commercial or similar applications.

According to EN 61439-6, a busbar trunking system BTS is a self-contained switchgear combination in the form of a conductor system. The conductor system contains busbars in a duct, a trough or a similar housing. The busbars are kept apart by insulating material.

The busbar trunking system BTS may consist of many mechanical and electrical resources including, for example:

- Busbar trunking units (busbar elements) without plug-in,
- Busbar trunking units (busbar elements) with plug-in,
- Tap-off units,
- Outgoing and adaptation units...

As a self-contained switchgear combination, the busbar trunking system BTS is encased so that a defined degree of protection is achieved.

The EN 61439-6 standard must be applied for busbar trunking systems BTS

- with a maximum of 1000 V_{AC} or 1500 V_{DC},
- with a rated current I_{nA} > 63 A

Busbar trunking unit BTU

(BTU: busbar trunking unit). According to EN 61439-6, a busbar trunking unit BTU-Is a complete unit of a busbar trunking system BTS. The complete unit includes

- the busbars,
- the busbar supports,
- the insulation of the external housing,
- fastening parts and parts connecting to other units.

Bus trunking units BTU have various geometric shapes, for example, straight length, T-elements, change directions.

- BTU with plug-in
  If a busbar trunking unit has been designed by the original manufacturer (Hager) so that tap-off units can be connected at defined points, one speaks of a busbar trunking unit with plug-in. The variant of the Hager unibar H busbar system with protection type IP55/IP65 provides various options for connecting tap-off units to busbar trunking units with plug-in.

- BTU with fire barrier material
  If an entire busbar trunking unit or a part of a busbar trunking unit is intended to prevent the propagation of fire between parts of a building for a certain time, one speaks of a busbar trunking fire barrier unit.

EN 61439

The EN 61439 standard series replaced the EN 60439 standard series. The EN 61439 standard series has the goal of harmonising the rules and requirements for low-voltage switching equipment combinations.

The valid part of the EN 61439 series of standards is always the applicable part of the standard, e.g. EN 61439-6 busbar trunking systems (busways) together with Part 1 of the standard (EN 61439-1).

Connection between European standard and International standard

European standard	International standard	German standard	Classification VDE specifications
EN 61439 (all parts)	IEC 61439 (all parts)	DIN EN 61439 (VDE 0660-600) (all parts)	VDE 0660-600 (all parts)

Parts of EN 61439 standard

Part of European standard	Content
EN 61439-1	Low-voltage switchgear and controlgear assemblies - Part 1: General rules
EN 61439-2	Low-voltage switchgear and controlgear assemblies - Part 2: Power switchgear and controlgear assemblies (PSC)
EN 61439-3	Low-voltage switching controlgear assemblies - Part 3: Distribution boards intended to be operated by ordinary persons
EN 61439-4	Low-voltage switchgear and controlgear assemblies - Part 4: Particular requirements for assemblies for construction sites (ACS)
EN 61439-5	Low-voltage switchgear and controlgear assemblies - Part 5: Assemblies for power distribution in public networks
EN 61439-6	Low-voltage switchgear and controlgear assemblies - Part 6: Busbar trunking systems (busways)
EN 61439-7	Low-voltage switchgear and controlgear assemblies - Part 7: Assemblies for specific applications such as marinas, camping sites, market squares, electrical vehicles charging stations

Supplements for parts of the EN 61439 standard

Part of European standard	Content
EN 61439-1 Supplement 1	General rules: Guidance to specifying assemblies
EN 61439-1 Supplement 2	General rules: A method of temperature-rise verification of low-voltage switchgear and controlgear assemblies by calculation
EN 61439-2 Supplement 1	Power switchgear and controlgear assemblies: Guide for testing under conditions of arcing due to internal fault

Rated diversity factor RDF

The rated diversity factor (RDF), as the characteristic properties of the switchgear and controlgear assembly, is particularly important for the safe operation of switchgear and controlgear assembly. The rated diversity factor is the share of the respective rated currents that any possible combination of outgoing current circuits can simultaneously and permanently carry without the switchgear and controlgear assembly overloading. An essential prerequisite here is that the load of the incoming unit must not exceed the rated current of the incoming unit.

In accordance with EN 61439-6, 5.4, a rated diversity factor of 1 is assumed for the entire busbar trunking system BTS (unless stated otherwise). All tap-off units may be permanently and simultaneously loaded with their rated current for this. At the same time, the limits for the busbar trunking runs and the supply unit(s) must be observed. The mutual interference between tap-off units is considered to be negligible. The number of main circuits in particular must be taken into account for the respective rated diversity factor for tap-off units with more than one outlet-side main circuit (details in EN 61439-6, 5.4).

User group of the busbar trunking system BTS

The unibar H is set up to establish busbar trunking systems BTS according to the series of standards EN 61439 Part 1 and Part 6. The following responsibilities apply according to EN 61439-1:

Project participants	Responsibilities according to EN 61439: Overview
Planner	Specifies a requirement profile for a busbar trunking system BTS according to the black box principle - Connection to the electrical system - Circuits and consumers - Installation and ambient conditions - Operating and maintenance. Planning is carried out by Hager in cooperation with the user (agreements, circumstances on site)
Original manufacturer	Is responsible for verifying the design by means of verification tests, calculations or the design rules according to EN 61439-1/-6 Hager is the original manufacturer of the unibar H busbar system.
Manufacturer	Builds the finished busbar trunking system BTS and is responsible for, among other things: - Dimensioning the busbar trunking system BTS according to the planner data - Compliance with the design verification of the original manufacturer - Designation of the system and documentation - Performance of the routine verification - Declaration of conformity..
Operator	- Receives a busbar trunking system BTS conforming to EN 61439 and the necessary certificates for verifying the conformity - Commissions the system manager - Instructs the personnel - Develops a safety concept / risk assessments - Orders suitable safety measures.

User

According to EN 61439, the user is an involved party who specifies, purchases, uses and/or operates switchgear and controlgear assembly. The user may also be someone who acts in the name of the involved party.

Operator

The responsible operator of an electrical system as an owner, leaseholder or lessee.

Index

A

Accessories • 47
Assembling the unibar H system • 70
Assembly principle for connection joints with protection type IP55/IP65 • 73
Assembly principle for connection joints with protection type IP68 • 75

B

Busbar elements • 88
  Design • 11
  Features • 13
Busbar trunking run / BTR • 88
Busbar trunking system BTS • 88
Busbar trunking unit BTU • 88

C

Cable end feeder • 42
Cable feeder • 42
Cable feeds • 77
Cable intermediate feeder • 42
Calculating the voltage drop • 57
Change Directions • 28
Changes of direction • 15
Characteristics of the busbar system • 8
Comments for specifications for tenders • 85
Conductor configurations of terminal elements • 37
Connecting to unimes H energy distributor • 62
Connection elements • 35
Connection joint with joint block • 13

D

Dimensions according to rated current • 12
Dimensions of the connection flanges for terminal elements • 38
Double body system (from 2500 A) • 12
Double horizontal change direction (Z-element) • 30
Double vertical change direction (Z-element) • 31
Drill holes for connecting flanges • 39

E

Elbow, horizontal • 28
EMC values • 58
EN 61439 • 89
End flange • 79
Expansion compensation unit • 27

F

Feeder units • 16
Fire barrier • 26, 77
Fitting tap-off units to connection joints • 82
Fitting tap-off units to plug-in • 80
For your safety • 64
Functional endurance • 60

H

Hangers • 70

I

Installation, handling and maintenance • 64
Intended use • 64

K

Knee, vertical • 29

L

Lifting busbar elements • 68

M

Mounting direction and installation position • 71

O

Operation, maintenance and enlargement • 83
Other types • 40

P

Product selection • 21

R

Rated diversity factor RDF • 90
Requirements for authorised personnel • 66

S

Sprinkler test • 59
Storage • 69
Straight busbar elements • 15, 22
Straight busbar elements with plug-in • 25
Straight busbar elements without plug-in • 22

T

Tap-off units • 43
Tap-off units for connection joints • 18, 46
Tap-off units for plug-in • 17, 44
T-element, horizontal • 33
T-element, vertical • 34
T-elements • 33
Temperature derating • 58
Transformer connection element • 35
Type key for busbar elements • 21, 24
Type key for tap-off units • 43

U

User group of the busbar trunking system BTS • 90

W

Why a busbar system? • 6

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