Starline®
A brand of legrand®

XCP BUSBAR INSTALLATION AND USER MANUAL

XCP HIGH POWER BUSBAR

XCP High Power Busbar

General information

The information in this installation manual offers general descriptions and takes into account the general technical features of the products discussed, with the object of guiding the user through the installation of the XCP busbar. Therefore, product reliability for specific user applications cannot rely on this manual to ensure suitability or reliability of the busbar.

Each user must assess the specific risks and test the product based on their own specific application. Neither Legrand, nor any of its subsidiaries or controlled companies shall be held responsible for the improper use of the information contained in this document.

For any suggestions of any kind regarding this manual, please contact Starline directly.
The user hereby agrees not to reproduce this manual in full or in part for commercial use, or for any other use that is not strictly personal.

The reproduction of this manual is also prohibited, on any supports whatsoever, including multimedia or internet publication, without the explicit written consent of Starline.

The publication of any types of hyperlinks to this manual or part thereof is also strictly prohibited.
The user of this manual agrees to use it exactly as it is written, and always at their own risk.

Only the manufacturer has the authority of intervening on individual components for replacement and repair purposes, in order to ensure the compliance of those described in this document.

The instructions of this manual must always be followed, to ensure correct installation of the components within the system.

Failure to comply with such instructions can cause injury or damage to system components and equipment.

Safety instructions
This product should be installed in compliance with installation rules, preferably by a qualified electrician. Incorrect installation and/or incorrect use can lead to risk of electric shock or fire.

Before carrying out the installation, read the instructions and take account of the product's specific mounting location.

Do not open up, dismantle, alter or modify the device except where specifically required to do so by the instructions. All Starline products must be opened and repaired exclusively by personnel trained and approved by Starline. Any unauthorised opening or repair completely cancels all liabilities and the rights to replacement and guarantees.

Use only Starline brand accessories.

Index

1. Introduction

1.1 Safety Information

1.1.1 Important Information

Here above general information concerning with signalling to take into account for all operative phases of the installation. This symbology and these messages are used all through the manual in order to highlight any potential dangerous situations or to arouse attention to procedures.

The addition of symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER
DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

WARNING
WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

CAUTION
CAUTION indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

NOTICE
NOTICE is used to address practices not related to physical injury.

PLEASE NOTE
Electrical equipment should be installed, operated, serviced, and verified only by qualified personnel.
No responsibility is assumed by Starline for any consequences arising out of the use of this material.
A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

1.2 Safety tips

WARNING

HAZARD OF CRUSHING AND FRACTURES

- Wear personal protective equipment when handling and installing the products (long sleeved jacket, trousers, gloves, safety shoes, helmet, and safety glasses).
- Only personnel who have been trained in safety regulations may work on construction sites to install busbar trunking systems.
- Work with extreme caution and follow the instructions provided in the manual.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

1.3 Purpose of the document

The present manual contains all the information necessary for the installation of Starline XCP busbar trunking system (Xtra Compact busbar).

It contains the rules and procedures to be taken into account during the different phases involved in the whole process related to the realization of the plant and its final power up.

In particular all preliminary requirements, specific installation procedures and overall recommendations are explained along the present manual.

Topics exposed can be divided into different sections:

- check of the equipment and of all the tools necessary for plant assembly
- check of all the material availability and its correct identification (both as an individual component and inside the whole system)
- pre-installation checks on connections among different components
- detailed operative installation procedures

Also checks to be carried out after installation and before to power up (“putting into service”) are exposed in this manual.

A final part related to the periodic checking of the plant during its life is also illustrated (with the definition of the types and frequency of the checks to be performed).

This manual is addressed to trained technical personnel.

1. Introduction

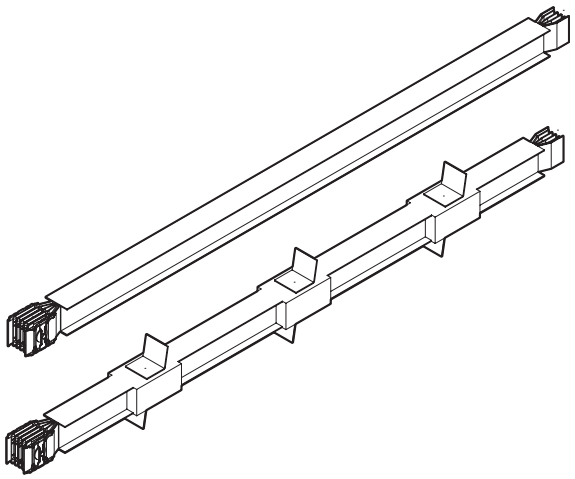
1.4 Product overview

1.4.1 Straight elements

Supplied with its pre-installed monobloc.

Feeder elements:
- standard length: 3 m
- special length: from 0,7 m to 3 m

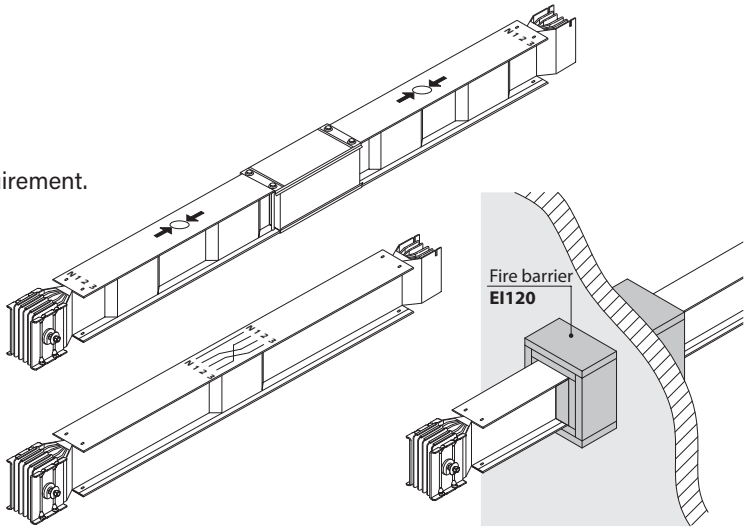
Distribution elements with tap-off outlets:
- standard length: 3 m
- standard tap-off sockets:
  spaced at 850 mm intervals on both sides



1.4.2 Additional elements

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

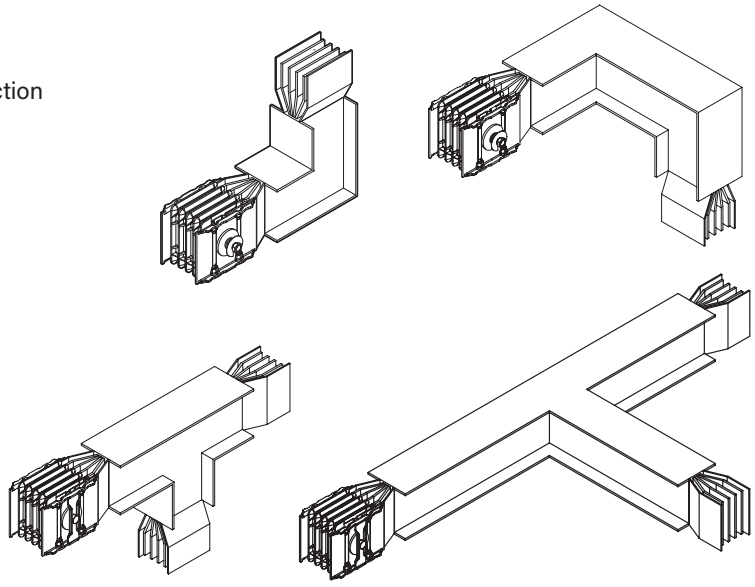
Elements with S120 fire barrier
Elements with phase balancing
Elements with thermal expansion device



1.4.3 Angle components

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

Elbows
Double elbows
Special T, X elements

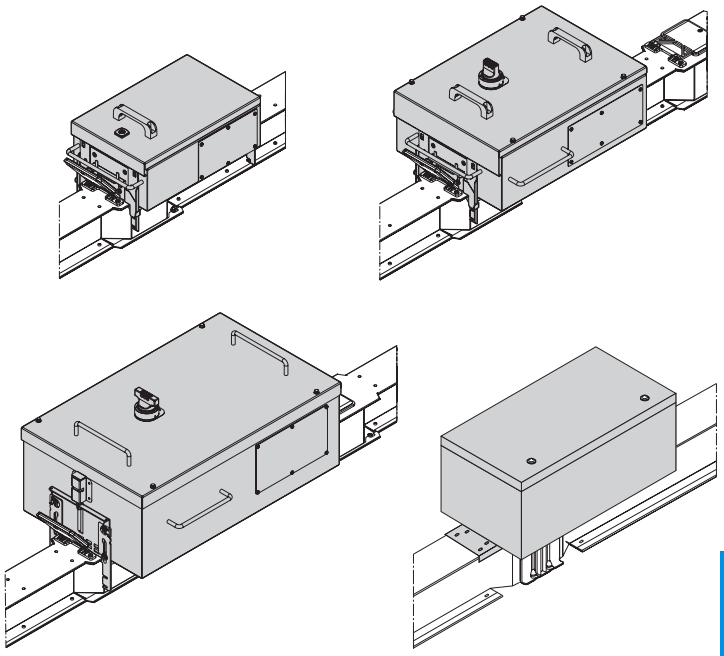


1.4.4 Tap-off boxes

Elements used for connecting and energizing electric loads.

Plug-in tap-off boxes from 63 A up to 630 A: (can be installed with busbar energized)
- with 3P fuse holders
- with switch disconnector and fuse holder
- for MCCB circuit breakers

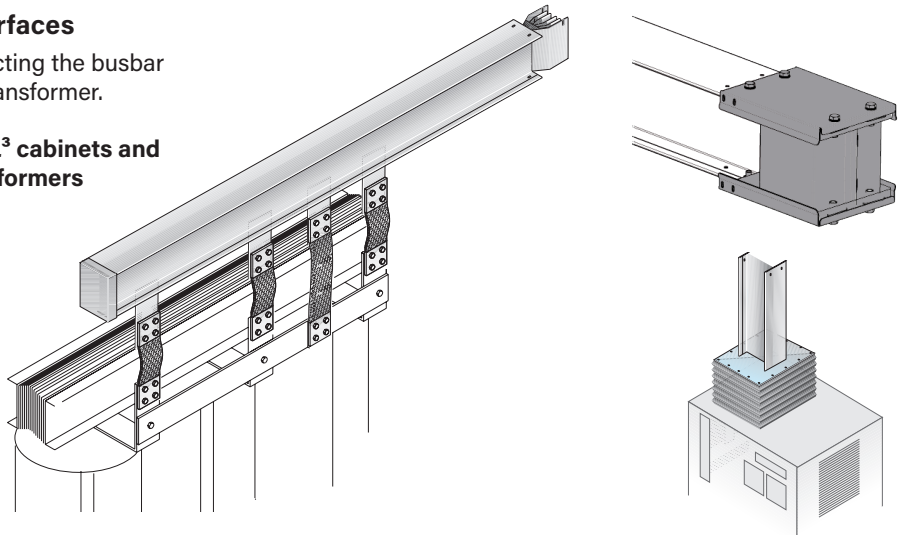
Bolted tap-off boxes from 125 A to 1250 A:
- with switch disconnector and fuse holder
- for MCCB circuit breakers



1.4.5 Connection interfaces

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

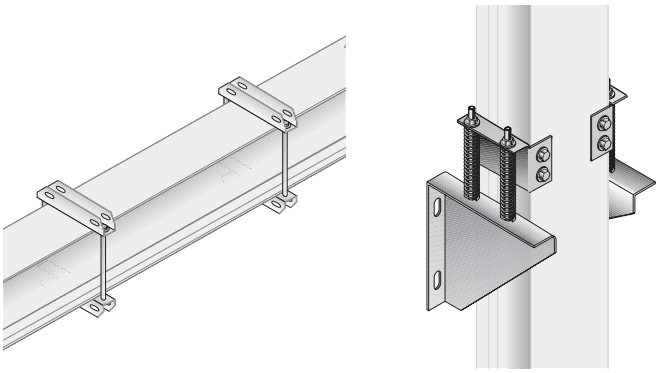
Solutions for Starline XL³ cabinets and Starline cast resin transformers
Universal solutions



1.4.6 Fixing supports

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

Options for horizontal installations
Options for vertical installations
Options for special applications (seismic areas, naval environment)



1. Introduction

1.5 System concept

Legrand Group allows for immediate integration between busbar trunking systems, cast resin transformers and XL^3 cabinets. Cast resin transformers can be made to order with a pre-installed interface connection for the busbar trunking systems.

The cabinets XL³ can be fitted by the panelbuilder with a XCP standard board connection. Thanks to a reinforcement kit it is possible to quickly and easily install any kind of board connection to the roof or bottom of the cabinet. The safety and the performance of the Starline system are guaranteed by the system approval certification, obtained following stringent tests carried out in the most important international labs.

1. Introduction

1.6 Certifications

1.6.1 Company approval certifications

CERTIFICATION AND QUALIFICATION MARKS

LOVAG CERTIFICATES

LOVAG is the Low Voltage Agreement Group, which is a Mutual Agreement Group of Certification Bodies founded in 1991, which has achieved a high level of competence in testing and certification of low voltage equipment. LOVAG's main purpose as an Agreement Group shall be for the mutual recognition of test reports and/or certificates of conformity by its signatories.

Membership	LOVAG presently has five signatories (Certification Bodies) to the Agreement: ACAE (Italy), Applus+ Laboratories (Spain), ASEFA (France), IMQ (Italy), and SGS Belgium NV - Division SGS CEBEC (Belgium) and employs more than 30 Testing Laboratories.
Certificates	LOVAG Certificates are issued by the LOVAG Certification Bodies using verification reports and certificates in a common and recognisable format in the market. They are recognised and accepted in the European Economic Area and elsewhere in the world.
LOVAG Instructions	LOVAG uses common Instructions for verification by Testing, Comparison or Assessment of the International and Standards covered by the Agreement and signatories to the Agreement abide by these when verifying for LOVAG Certification.
Qualifications	All signatory bodies to the Agreement are accredited to ISO IEC 17065 by accreditors being members of IAF, the International Accreditation Forum. They are located in a member country of the EU and their laboratories are accredited and/or assessed to EN ISO/IEC 17025.

For further information contact your local certification body or the Secretariat of LOVAG by e-mail or by fax from the list below.

LOVAG Certification Bodies and LOVAG Secretariat:

1.6.2 The certificates

The XCP product line has been given Type- Approval Certifications by the most prestigious Electro-technical agencies:

- Certificate of Compliance with Standard: IEC 61439-6

The XCP range has undergone the following type tests, as confirmation of their quality:

- EI 120 Fire Barrier Test
- IEC 60331-1 / CEI EN 50362 - Fire Resisting Test

ACAE
Via Tito Livio 5
I-24123 Bergamo
ITALY
Fax: + 39 035 453 4662
e-mail: acae@acaecert.it
Web : www.acaecert.it

ASEFA
33 Av du General Leclerc
F-92260 Fontenay-aux-roses
FRANCE
e-mail: contact@asefa-cert.com
Web: www.asefa-cert.com

Applus+ Laboratories
Campus UAB
E-08193 Bellaterra
(Barcelona) SPAIN
Fax: + 34 93 567 20 01
e-mail: info.appluslaboratories@applus.cc
Web: www.applus.corp.com

SGS Belgium N.V.
Division SGS CEBEC
Business Riverside Park
Av Internationalelaan, 55
B-1070-Brussels BELGIUM
Fax: + 32 2 556 00 36
e-mail: silvio.piras@sgs.com
Web: www.cebec.sgs.com

IMQ S.p.A.
Via Quintiliano 43
20138 Milano
ITALY
Fax: +39 0250991510
e-mail : lovag@imq.it
Web: www.imq.it

LOVAG Secretariat
at **ETICS aisbl**
Rue des Deux Églises, 29
B-1000-Brussels - BELGIUM
e-mail: secretariat@etics.org
Web: www.lovag.net

1. Introduction

LOVAG

A C A E

Certificate of Conformity

LOVAG-Certificate No.: IT 21.022
Page 1 of 3

This Certificate applies only to the apparatus verified. The responsibility for conformity of any apparatus having the same designation with that verified rests with the manufacturer.

This certificate has been prepared according to LOVAG (Low Voltage Agreement Group) Objectives and Operating Principles of mutual recognition. The responsible certification body as a member of LOVAG issues a Certificate of Conformity with the above mentioned Standard(s)following the exclusive use of LOVAG Verification instruction wherever applicable

Only integral reproduction of this Certificate or reproductions of this page accompanied by any page(s) on which are stated the verifications performed and the assigned rated characteristics of the apparatus verified, are permitted without written permission from the LOVAG Signatory responsible for this Certificate

Apparatus: Low-voltage busbar trunking system
1000V (U_e) – 1000V (U_i) – 12kV (U_{imp}) – 50/60Hz – 2500A (I_{nA}) – 120kA,1s (I_{cw}) – IP55/IP65

Designation Type : XCP-HP 2500A Al (4C,5C Type1,2,3)

Manufacturer : Starline Holdings LLC
168 Georgetown Rd.
Canonsburg, PA 15317 (USA)

Applicant : Starline Holdings LLC
168 Georgetown Rd.
Canonsburg, PA 15317 (USA)

Verified by ACAE Laboratory:
IB01/LAM Varese (Italy)
IZ01 Castrezzone di Muscoline BS (Italy)
IV01 Budapest (Hungary)
CSI Bollate MI (Italy)

The apparatus, constructed in accordance with the description mentioned in the Reports listed in this Certificate has been subjected to the series of proving verifications in accordance with IEC 61439-6 (2012-05) and EN 61439-6 (2012-08).

The results are shown in the Reports in accordance to LOVAG. The values obtained and the general performance are considered to comply with the above Standard(s) and to justify the characteristics assigned by the manufacturer.

ACCREDIA
PRD N°070B
Signatory of EA, IAF and ILAC Mutual Recognition Agreements

Responsible Certification Body: ACAE
Via Tito Livio, 5 – 24123 – BERGAMO (Italy)

Authorized Signature VirginioScarioni
Date 2021.02.10

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A C A E

LOVAG

Certificate
of Conformity

LOVAG-Certificate No.: IT 21.022
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Standard IEC 61439-6 Subclause	TEST	Test Report No.
10.2.2	Resistance to corrosion severity test A	1504—IP *
10.2.3.1	Thermal stability test Bb	1504—IP *
10.2.3.2	Resistance to abnormal heat and fire due to internal electric effects	1504—IP *
10.2.6	Protection against mechanical impact IK10	1747-1
10.2.7	Marking	1504—IP *
10.2.101	Ability to withstand mechanical loads heavy loads	1747-1
10.101	Resistance to flame-propagation	0226\DC\REA\19_2 *
10.3	Degree of protection of assembly IP55 and IP65	1504—IP *
10.4	Clearances and creepage distances	1747-1
10.5	Protection against electric shock and integrity of protective circuits 72kA -1s	11252/VNL
10.9.2	Power-frequency withstand voltage	1747-1
10.9.3	Impulse withstand voltage Uimp 12kV	1747-1
10.10	Temperature-rise limits	1747-1
10.11	Short-circuit withstand strength 120kA – 1s	11252/VNL
10.13	Mechanical strength/operation	Not applicable

* The tests were carried-out on types which are representative of the product under certification.

ACCREDIA
PRD N°070B
Signatory of EA, IAF and ILAC Mutual Recognition Agreements

Responsible Certification Body: ACAE
Via Tito Livio, 5 – 24123 – BERGAMO (Italy)

Virginio Scarioni

Authorized Signature: Virginio Scarioni
Date: 2021.02.10

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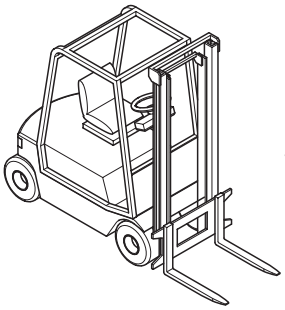
2. Material preparation and arrangement

2.1 Equipment and Tools

2.1.1 Introduction

Here below the tools, equipment and materials necessary you need to have before to start the installation of Starline XCP Busbar Trunking System.

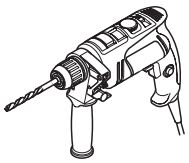
2.1.2 Lifting and handling equipment



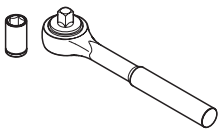
Crane or forklift truck capable of lifting 1.5 tons (minimum). In function of the plant and the typology of components.

2.1.3 Supports for positioning and installing

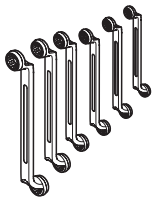
Measuring tape (metric).



Drilling machine capable of drilling through concrete.

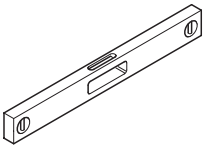


Socket wrench with sockets (8...24 mm).

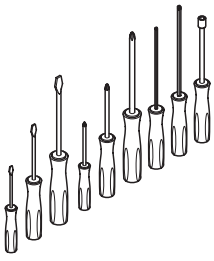


Set of flat or ring spanners (8...24 mm).

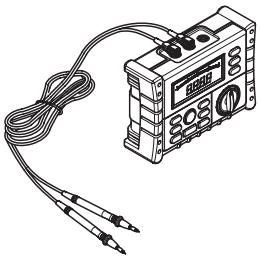
Two slings for handling the components.



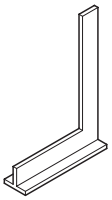
Levelling instrument (spirit level).



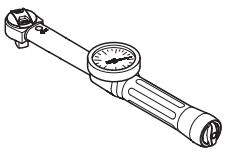
Set of screwdrivers.



Insulation tester (Megohmmeter 1000 Vdc)



Carpenters square.

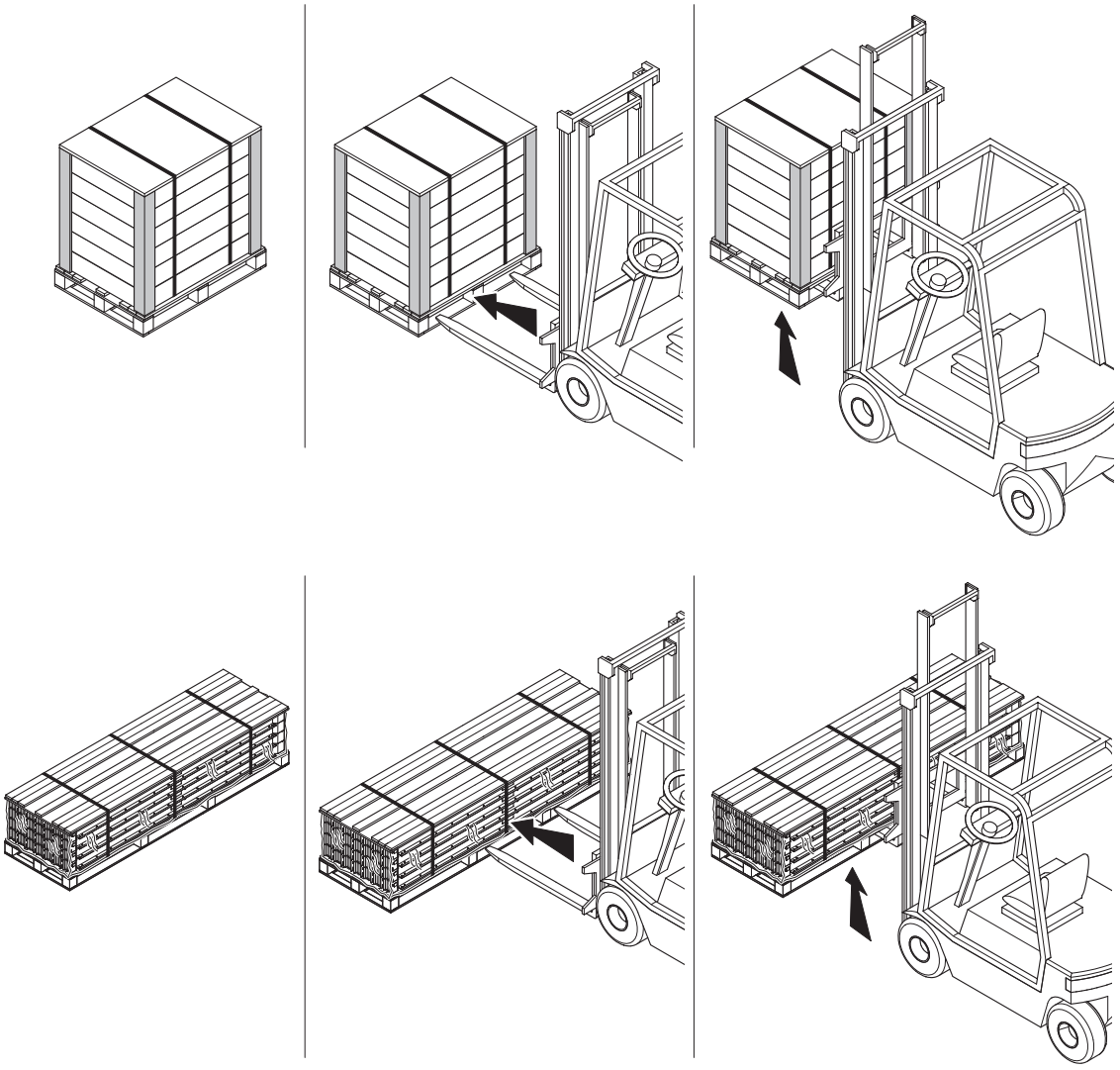


Torque wrench only for periodic check inspection or when an element is placed for the second time.

2.2 Storage

Below are the instructions to follow for a correct storage of the materials. Failure to comply with the indications supplied may cause damage to the materials, and make the product warranties void. Store the material in a dry place, protected from weather conditions such as rain and humidity, to prevent the formation of condensation inside the busbars. Also ensure that the busbars are protected from smoke, water, soil, mud, dust, or dirt in general. Position the material in a way that prevents a physical damage to it. It is recommended that the material is stored indoor, in a dry location. In case of storing the busbars outside for short-medium periods, ensure that it is appropriately protected, to avoid accidental infiltration of water, which will result in them being damaged. The material can be transported and stored at a temperature between -25°C and +55°C. Handling operations must be carried out implementing all the necessary precautions to ensure the integrity of the materials. The manufacturer shall not be held responsible for any material damage caused by failure to ensure appropriate protection.

Material handling



2. Material preparation and arrangement

2.3 Weight table

			SINGLE BAR						DOUBLE BAR			TRIPLE BAR
XCP-S Aluminum	PE version	Weight	In [A] 630	In [A] 800	In [A] 1000	In [A] 1250	In [A] 1600	In [A] 2000	In [A] 2500	In [A] 3200	In [A] 4000	In [A] 5000
XCP 3C AL	(PE 1)	[kg/m]	13.3	14.2	14.5	16.6	19.8	23.6	29.9	35.9	42.9	58.8
	(PE 2)	[kg/m]	16.6	17.5	17.8	21.0	24.6	30.1	37.9	45.4	53.4	71.8
	(PE 3)	[kg/m]	14.3	15.3	15.5	18.0	21.4	25.5	32.5	39.0	46.4	63.0
XCP 4C AL	(PE 1)	[kg/m]	14.3	15.6	16.0	18.6	22.5	27.4	34.1	41.5	50.4	68.6
	(PE 2)	[kg/m]	17.6	18.9	19.3	22.9	27.3	33.9	42.1	51.0	61.0	81.7
	(PE 3)	[kg/m]	15.4	16.7	17.1	20.0	24.1	29.2	36.7	44.6	54.0	72.9
XCP 5C AL	(PE 1)	[kg/m]	15.3	17.0	17.6	20.5	25.2	31.1	38.3	47.1	58.0	78.5
	(PE 2)	[kg/m]	18.6	20.3	20.9	24.9	30.0	37.6	46.3	56.6	68.6	91.6
	(PE 3)	[kg/m]	16.4	18.0	18.7	22.0	26.7	33.0	40.9	50.2	61.5	82.8
XCP 2N AL	(PE 1)	[kg/m]	15.3	17.0	17.6	20.5	25.2	31.1	38.3	47.1	58.0	78.5
	(PE 2)	[kg/m]	18.6	20.3	20.9	24.9	30.0	37.6	46.3	56.6	68.6	91.6
	(PE 3)	[kg/m]	16.4	18.0	18.7	22.0	26.7	33.0	40.9	50.2	61.5	82.8

			SINGLE BAR					DOUBLE BAR				TRIPLE BAR
XCP-S Copper	PE version	Weight	In [A] 800	In [A] 1000	In [A] 1250	In [A] 1600	In [A] 2000	In [A] 2500	In [A] 3200	In [A] 4000	In [A] 5000	In [A] 6300
XCP-S 4C Cu	(PE 1)	[kg/m]	21.2	23.8	26.9	33.5	42.5	51.0	63.0	80.9	114.9	155.2
	(PE 2)	[kg/m]	24.5	27.1	30.2	37.8	47.6	57.7	71.0	90.4	125.4	168.3
	(PE 3)	[kg/m]	22.3	24.9	28.0	34.9	44.2	53.2	65.6	84.0	118.4	159.5
XCP-S 3C Cu	(PE 1)	[kg/m]	18.7	20.6	22.9	28.0	35.0	42.2	51.9	65.8	91.6	126.8
	(PE 2)	[kg/m]	22.0	23.9	26.2	32.4	40.2	48.8	59.9	75.3	102.1	139.9
	(PE 3)	[kg/m]	19.7	21.7	23.9	29.5	36.7	44.4	54.5	68.9	95.1	131.0
XCP-S 5C Cu	(PE 1)	[kg/m]	23.7	27.1	31.0	38.9	49.9	59.9	74.1	96.0	138.1	183.5
	(PE 2)	[kg/m]	27.1	30.4	34.4	43.3	55.1	66.5	82.1	105.5	148.6	196.6
	(PE 3)	[kg/m]	24.8	28.1	32.1	40.3	51.6	62.0	76.7	99.1	141.6	187.8
XCP-S 2N Cu	(PE 1)	[kg/m]	23.7	27.1	31.0	38.9	49.9	59.9	74.1	96.0	138.1	183.5
	(PE 2)	[kg/m]	27.1	30.4	34.4	43.3	55.1	66.5	82.1	105.5	148.6	196.6
	(PE 3)	[kg/m]	24.8	28.1	32.1	40.3	51.6	62.0	76.7	99.1	141.6	187.8

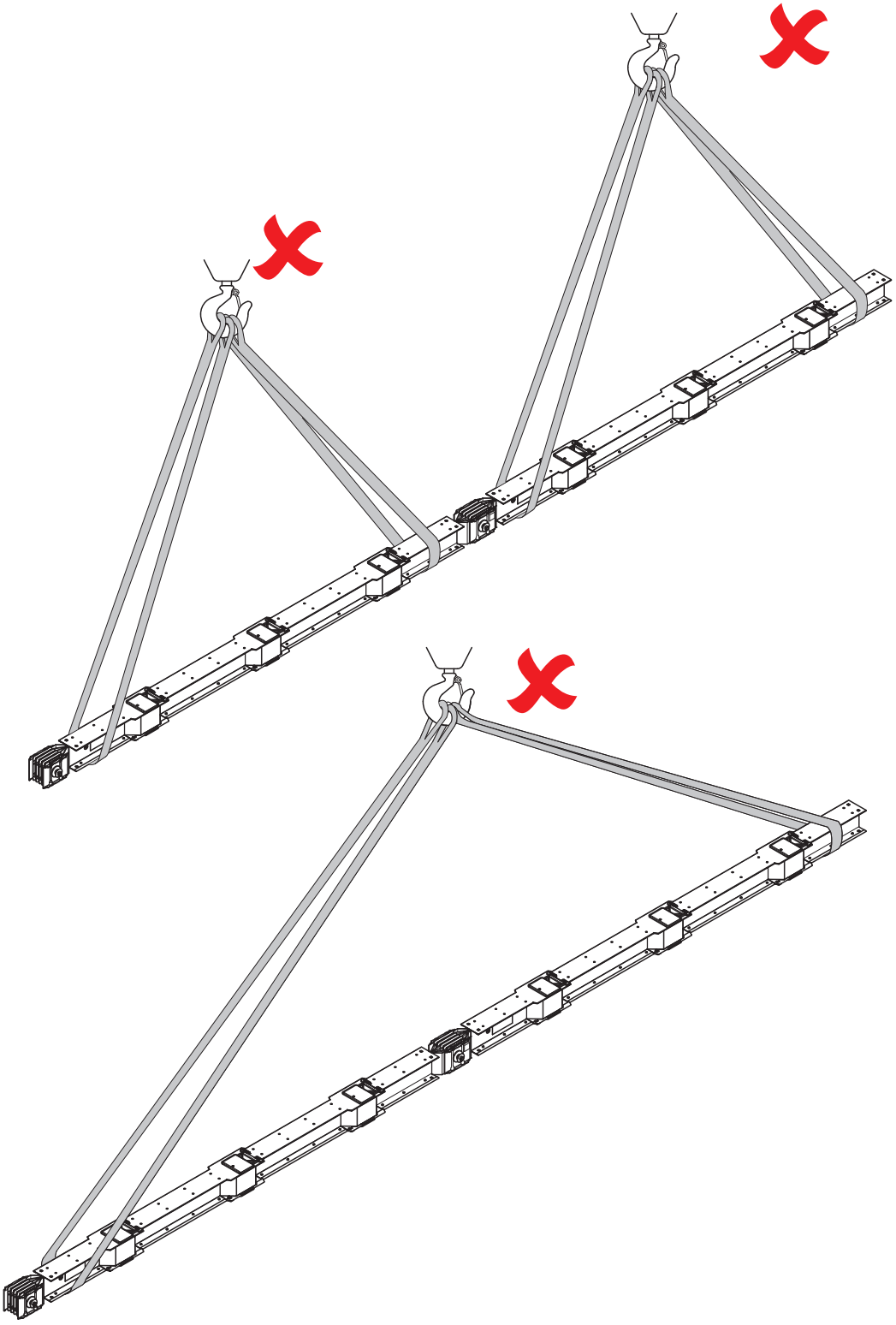
			SINGLE BAR						DOUBLE BAR			TRIPLE BAR
XCP-HP Aluminum	PE version	Weight	In [A] 630	In [A] 800	In [A] 1000	In [A] 1250	In [A] 1600	In [A] 2000	In [A] 2500	In [A] 3200	In [A] 4000	In [A] 5000
XCP-HP 4C AL	(PE 1)	[kg/m]	11.3	11.3	13.0	14.6	18.9	22.4	26.7	35.0	41.1	61.7
	(PE 2)	[kg/m]	14.6	14.6	16.3	17.9	24.1	28.1	35.5	45.2	52.4	78.7
	(PE 3)	[kg/m]	12.3	12.3	14.1	15.7	20.6	24.3	29.6	38.3	44.8	67.2
XCP-HP 3C AL	(PE 1)	[kg/m]	9.7	9.7	11.0	12.2	15.5	18.2	21.6	27.9	32.5	50.4
	(PE 2)	[kg/m]	13.0	13.0	14.3	15.5	20.7	23.9	30.4	38.2	43.9	67.4
	(PE 3)	[kg/m]	10.8	10.8	12.1	13.3	17.2	20.0	24.5	31.2	36.2	55.9
XCP-HP 5C AL	(PE 1)	[kg/m]	17.5	17.5	19.7	21.7	22.4	26.7	31.8	42.0	49.7	73.0
	(PE 2)	[kg/m]	20.8	20.8	23.0	25.0	27.5	32.4	40.6	52.3	61.0	90.0
	(PE 3)	[kg/m]	21.0	18.6	20.8	22.7	24.0	28.5	34.7	45.4	53.3	78.5
XCP-HP 2N AL	(PE 1)	[kg/m]	17.5	17.5	19.7	21.7	22.4	26.7	31.8	42.0	49.7	73.0
	(PE 2)	[kg/m]	20.8	20.8	23.0	25.0	27.5	32.4	40.6	52.3	61.0	90.0
	(PE 3)	[kg/m]	21.0	18.6	20.8	22.7	24.0	28.5	34.7	45.4	53.3	78.5

			SINGLE BAR						DOUBLE BAR			TRIPLE BAR
XCP-HP Copper	PE version	Weight	In [A] 800	In [A] 1000	In [A] 1250	In [A] 1600	In [A] 2000	In [A] 2500	In [A] 3200	In [A] 4000	In [A] 5000	In [A] 6300
XCP-HP 4C Cu	(PE 1)	[kg/m]	16.4	22.2	24.8	27.7	44.7	55.3	63.3	85.5	117.0	150.0
	(PE 2)	[kg/m]	19.7	25.5	28.1	32.1	49.0	66.7	72.0	95.8	128.3	165.5
	(PE 3)	[kg/m]	17.5	23.2	25.9	29.1	46.1	59.0	66.1	89.1	120.9	155.0
XCP-HP 3C Cu	(PE 1)	[kg/m]	18.7	22.9	24.9	28.0	41.6	52.2	60.3	78.6	103.2	126.2
	(PE 2)	[kg/m]	22.0	26.2	28.2	32.4	45.9	63.5	69.0	88.9	114.5	141.6
	(PE 3)	[kg/m]	19.7	23.9	25.9	29.5	43.0	55.8	63.1	82.2	107.1	130.5
XCP-HP 5C Cu	(PE 1)	[kg/m]	23.8	31.1	34.5	39.0	59.9	74.3	88.2	117.3	157.4	189.7
	(PE 2)	[kg/m]	27.2	34.5	37.8	43.4	64.3	85.6	96.9	127.6	168.8	205.1
	(PE 3)	[kg/m]	24.9	32.2	35.5	40.4	61.3	78.0	91.1	120.8	161.4	193.9
XCP-HP 2N Cu	(PE 1)	[kg/m]	23.8	31.1	34.5	39.0	59.9	74.3	88.2	117.3	157.4	189.7
	(PE 2)	[kg/m]	27.2	34.5	37.8	43.4	64.3	85.6	96.9	127.6	168.8	205.1
	(PE 3)	[kg/m]	24.9	32.2	35.5	40.4	61.3	78.0	91.1	120.8	161.4	193.9

2. Material preparation and arrangement

2.4 Handling and lifting

WARNING
All lifting operations refer to a single component.



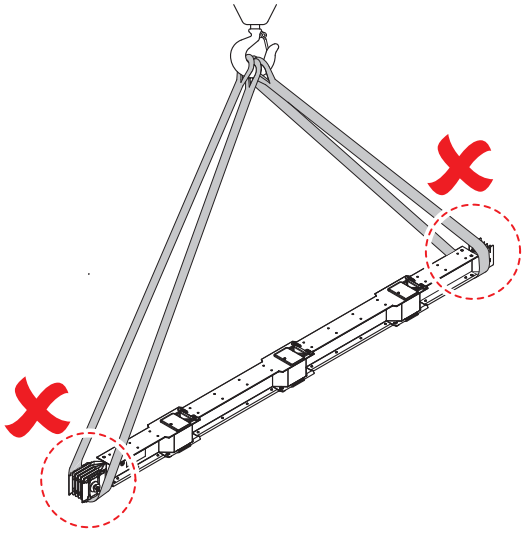


Fig. 1
Do not lift the busbars from their ends.

Fig. 1

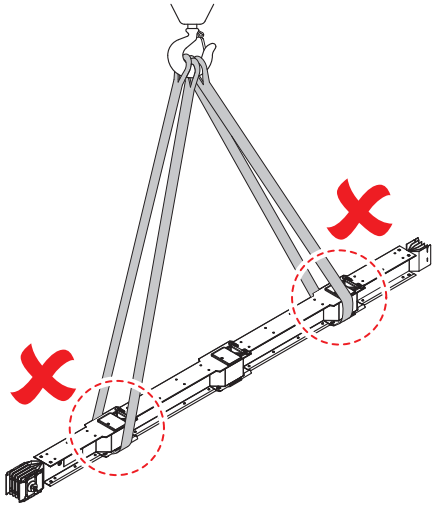


Fig. 2
Do not use belts or other systems to lift them to the junction windows.

Fig. 2

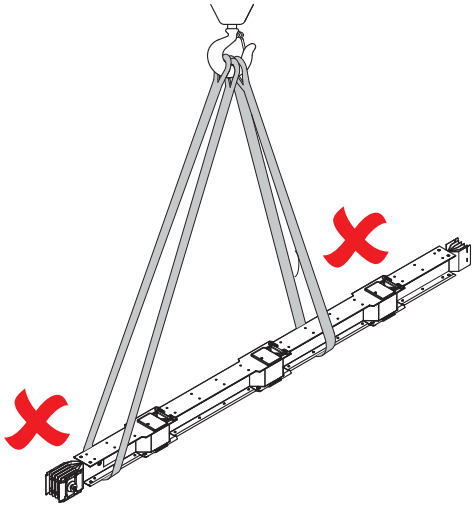


Fig. 3
Do not use belts or other systems to lift the busbars in unbalanced positions.

Fig. 3

2. Material preparation and arrangement

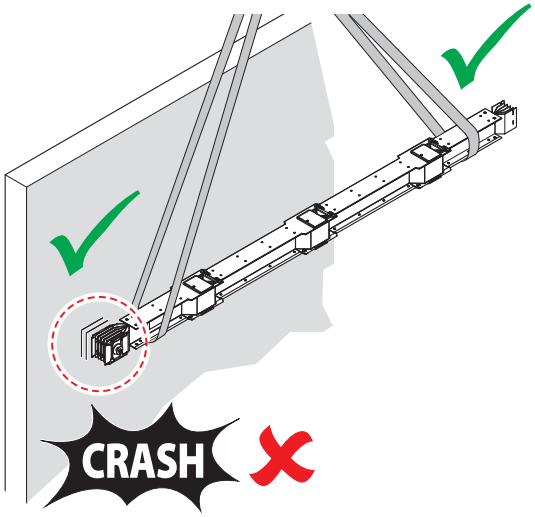


Fig. 4
Handle the busbars with due care and attention. Do not subject busbars to torsions, dents, violent impact, or sharp movements that may damage their internal components.

Fig. 4

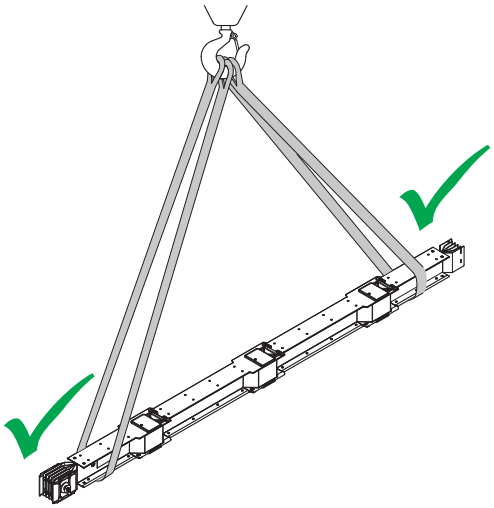


Fig. 5
Correct way of lifting the busbars.

Fig. 5

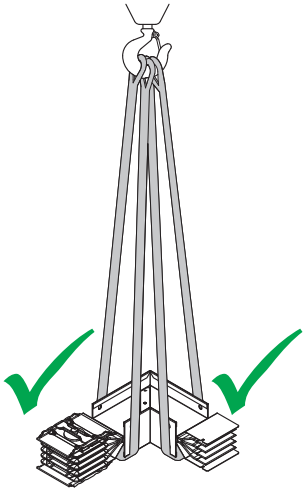


Fig. 6
When lifting not linear shape path components, pay particular attention to their own centre of gravity. Use equipment that will not damage surfaces.

Fig. 6

2.5 Missing or damaged components

GOOD RECEPTION
Upon receipt of the goods check the following:
1) integrity of the packaging, and the goods, if delivered in a see-through package.
2) consistency of the material with the delivery note and the packing list, if supplied.
3) consistency of the material with the order acknowledgement details.
In case of any disclaims, please inform us in writing following the instructions found in the notifications section.

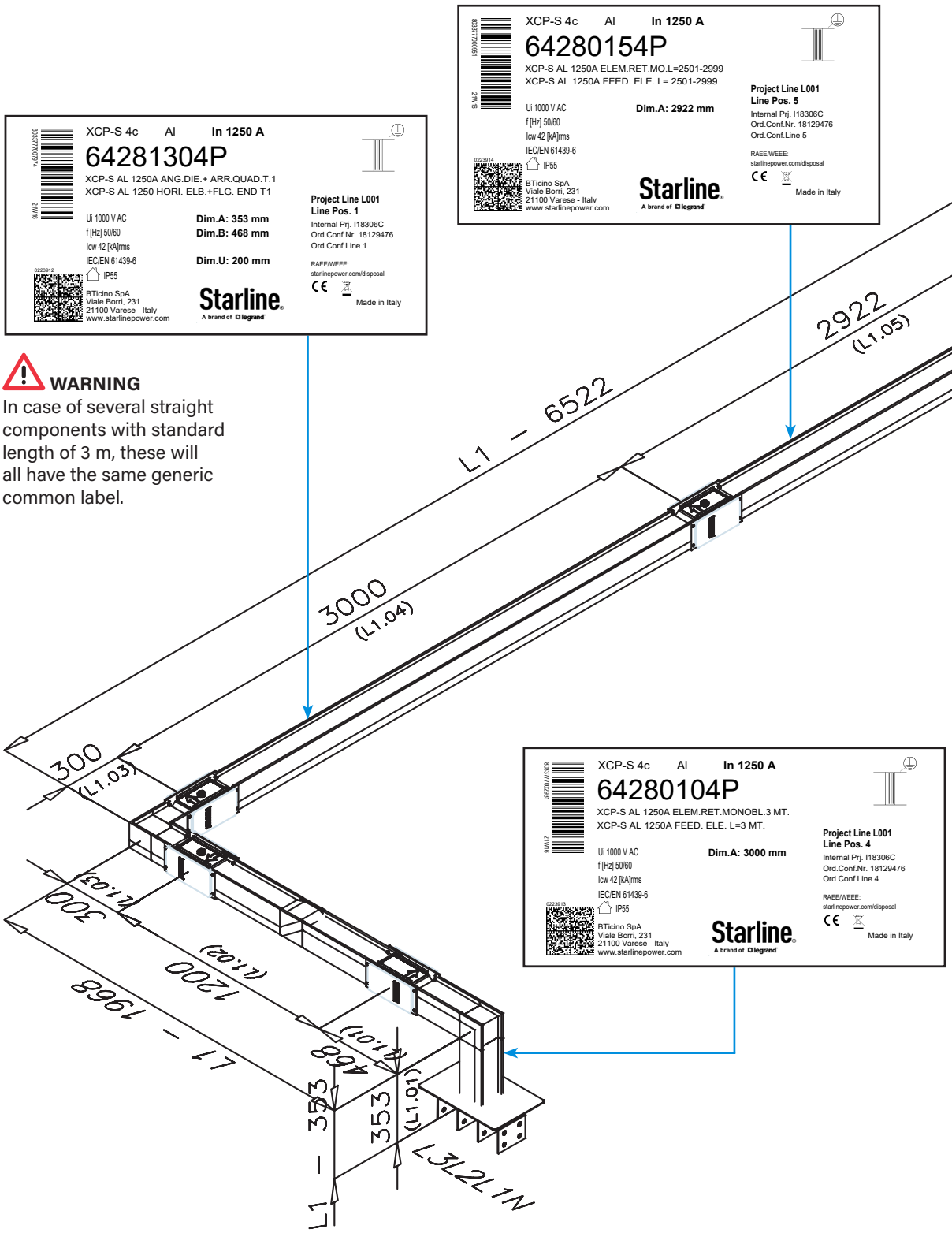
NOTIFICATIONS
In case of any disclaim, please forward your official complaint to a Starline referent.

When notifying that a wrong item has been received, please indicate the item code no. found on the packaging, and the item code no. found on the part (if possible include a photo of the labels).

2. Material preparation and arrangement

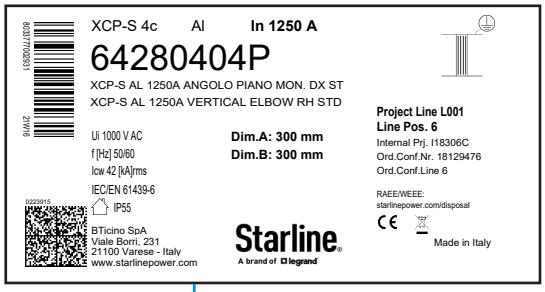
2.6 Product type identification

Before beginning installation, you must compare the plan which you received from the design office project al layout of the building. For custom-made products based on specific projects, check the system drawing to ensure that the components match.

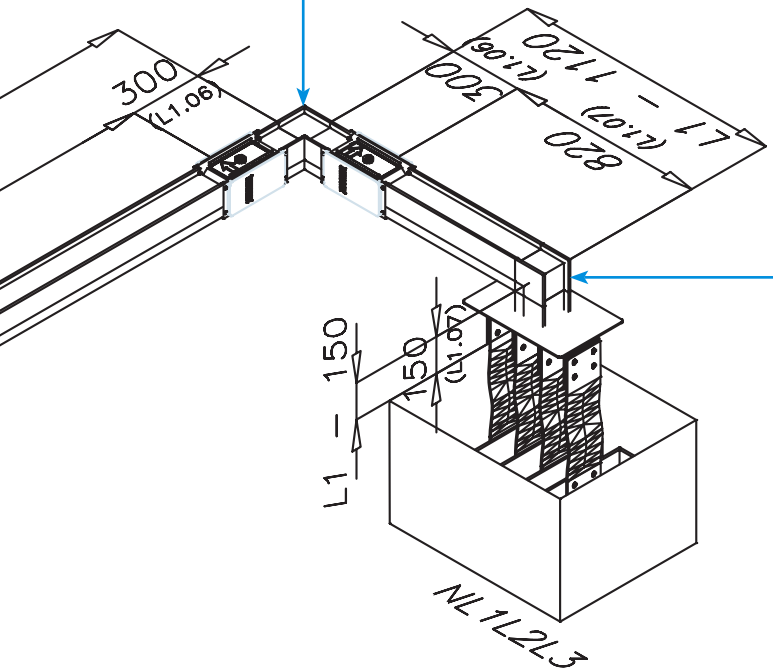


WARNING

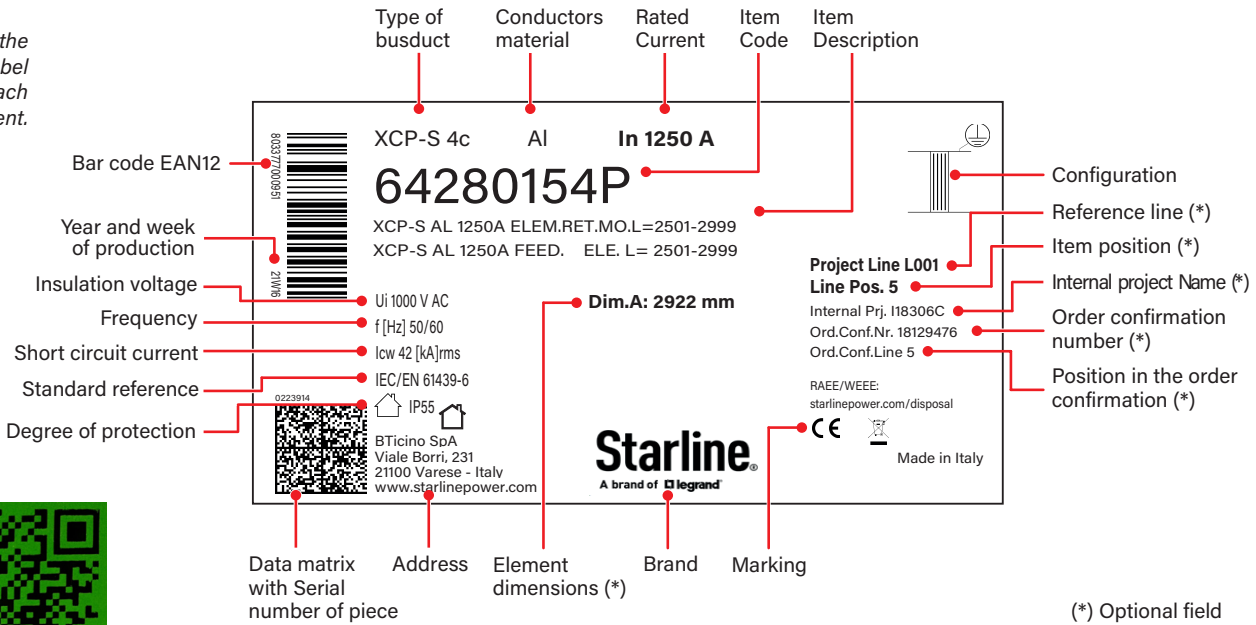
In case of several straight components with standard length of 3 m, these will all have the same generic common label.



Code	Description
64281304P	XCP-S AL 1250A HORI. ELB.+FLG. END T1
64287124P	XCP-S AL 1250A STR.LENG INVER.FASI L.1,2MT
64280404P	XCP-S AL 1250A VERTICAL ELB. RH STD
64280104P	XCP-S AL 1250A FEEDER ELE. L=3M
64280154P	XCP-S AL 1250A FEEDER ELE. L=2501-2999
64280404P	XCP-S AL 1250A VERTICAL ELB. RH STD
64281334P	XCP-S AL 1250A HORI. ELB.+FLG. END T4



Details of the adhesive label found on each component.



(*) Optional field

QR code containing all the identification datas of the specific piece with relative electrical response datas to tests.

3. Installation

WARNING
Where not differently specified, dimensions indicated in the manual are to be intended in millimeters (mm).

3.1 Checks before installation

3.1.1 Visual / electric checks

Before the installation, all material should be inspected for damage.
When installing the busbars comply with the following:

1 Do not position the busbars near pipes containing liquids.
2 For the installation only use bracketing systems supplied by Starline, and follow the instructions found in the catalogue or enclosed with the item.
3 Only use accessories supplied by Starline.
4 Check that the operating voltage coincides with that indicated on the product plate.
5 Check that the system operating current does not exceed the product rated current, downgrade it if required.
6 Check if the busbar capacity must be downgraded (for example due to high ambient temperature, presence of harmonics, etc.)
7 Do not install the standard product in particular environments (high concentration of chlorine, explosive atmosphere, etc.).
8 For outdoor installations, protect the busbar with a protection canopy. The IP55 protection degree can be affected by unsuitably protected outdoor installation.

3.1.2 General rules for installing supports

Hazard of improper installation

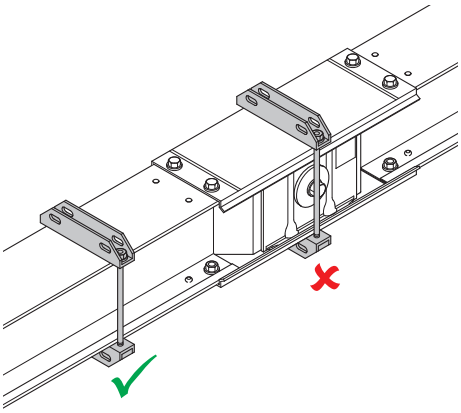
Before installation: be sure to have well the layout plan

During installation: be sure to consider correct separation distances between the supports. These have to be levelled, so to guarantee final levelling also for path components.
Be sure that all supports are able to sustain the weights of the path components.
Failure to follow these instructions can result in injury or equipment damage.

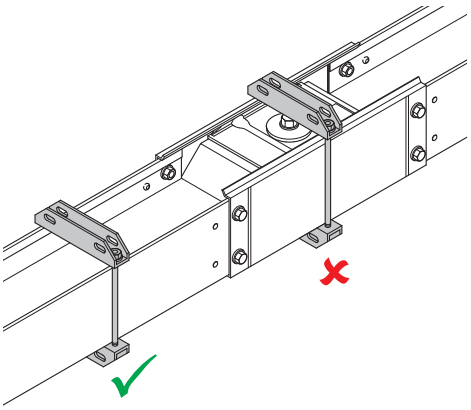
Introduction
Correct installation of supports is fundamental to realize a proper installation of path components.
Here below, a list of rules to take into account during installation of supports and path components.

General Installation rules for supports
Follow these general rules for installing supports:
- All path components have to be correctly sustained
- To get advantage in installation, be sure to use more than one support for each path component
- The supporting capacity of the support must be at least the weight of the path component plus 90 kg, in accordance with IEC 61439-6.

Edgewise horizontal installation:

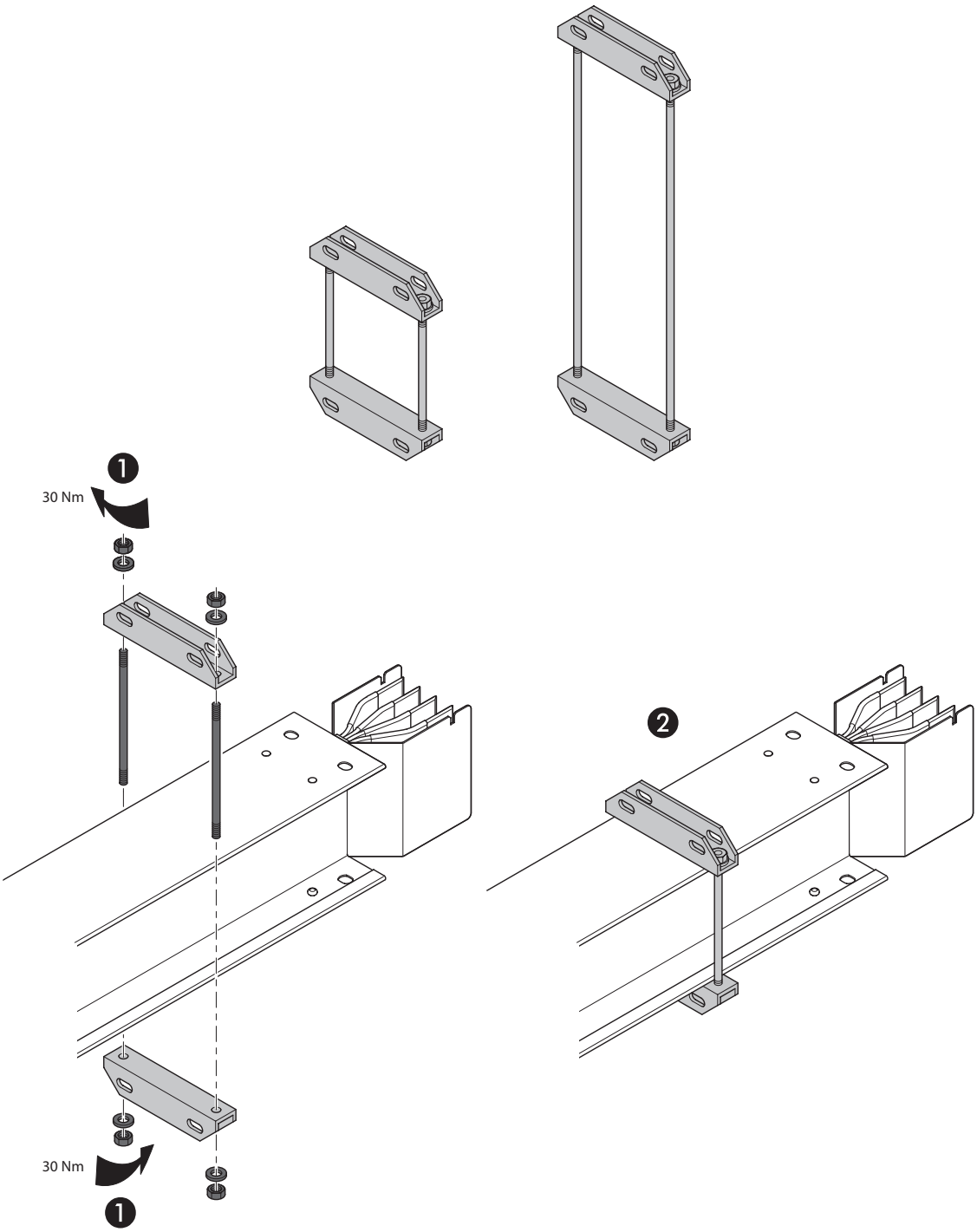


Flatwise horizontal installation:

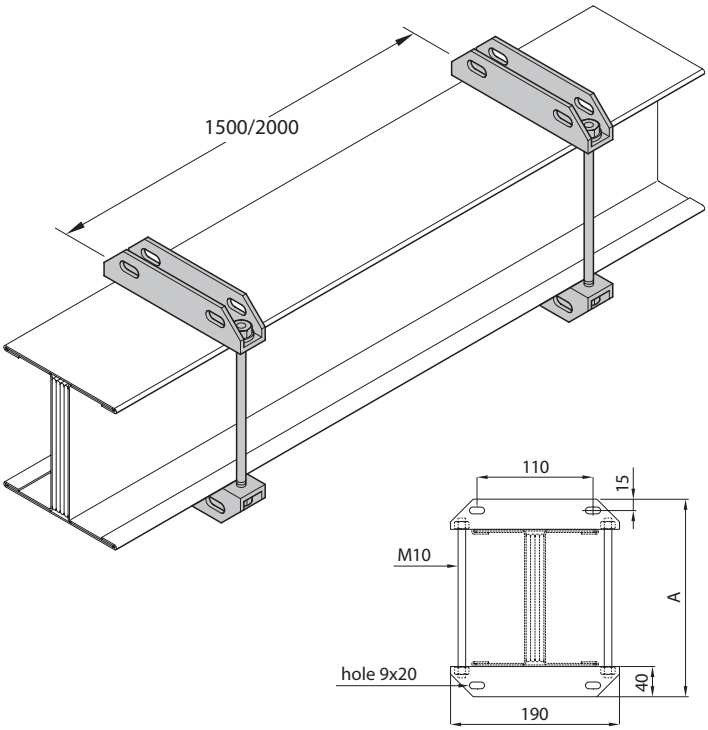


- Use different support for components at the terminal ends of the path.
- Be sure to not sustain weight of end components by transformers or switchboards.
- Sustain vertical branches near to the elbow angle.
- Be sure to support Elbows and “Z” units one at a time.
- Even if supports have to installed near to joint blocks, it has never to be put exactly under a joint block.
- Keep the right distance from tap-offs ..mm(show picture)

3.1.3 Fixing accessories

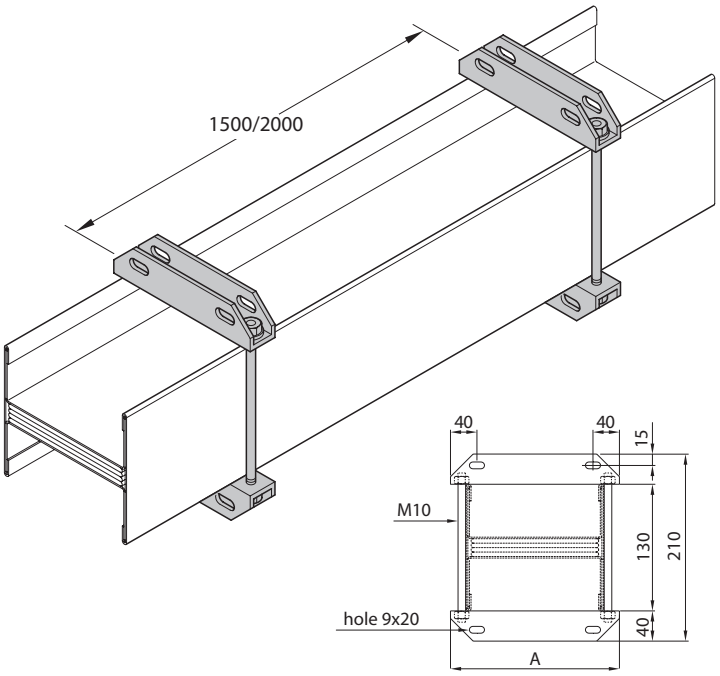


3. Installation



Rating XCP-S	A (mm)	
	Al	Cu
630	210	-
800	210	210
1.000	210	210
1.250	250	210
1.600	280	250
2.000	300	280
2.500	460	380
3.200	520	460
4.000	560	520
5.000	670	560
6.300	-	670

Rating XCP-HP	A (mm)	
	Al	Cu
630	210	-
800	210	210
1.000	210	210
1.250	210	210
1.600	280	250
2.000	300	250
2.500	460	300
3.200	520	460
4.000	560	520
5.000	820	560
6.300	-	760

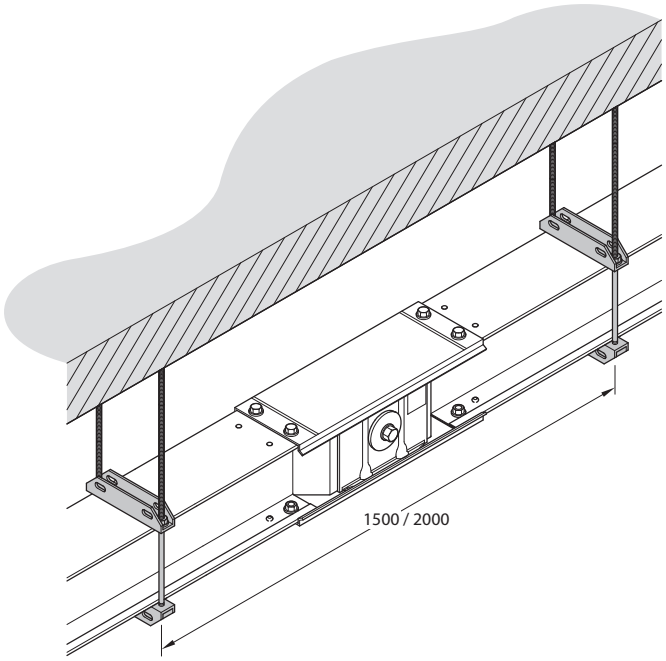


Rating XCP-S	A (mm)	
	Al	Cu
630	190	-
800	190	190
1.000	190	190
1.250	315	190
1.600	315	315
2.000	315	315
2.500	430	350
3.200	490	430
4.000	530	490
5.000	640	530
6.300	-	640

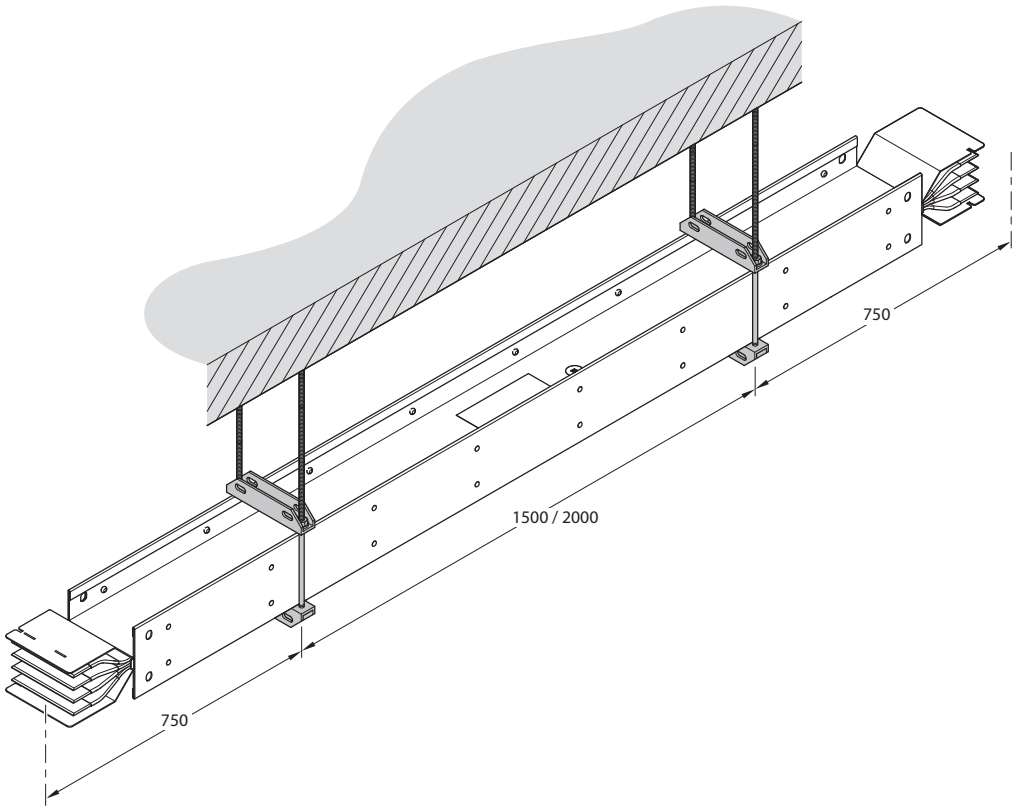
Rating XCP-HP	A (mm)	
	Al	Cu
630	190	-
800	190	190
1.000	190	190
1.250	190	190
1.600	315	315
2.000	315	315
2.500	430	315
3.200	490	430
4.000	530	490
5.000	790	530
6.300	-	730

3. Installation

Supports for Edgewise Installation
For edgewise installations, the maximum recommended distance between supports is 2000 mm.



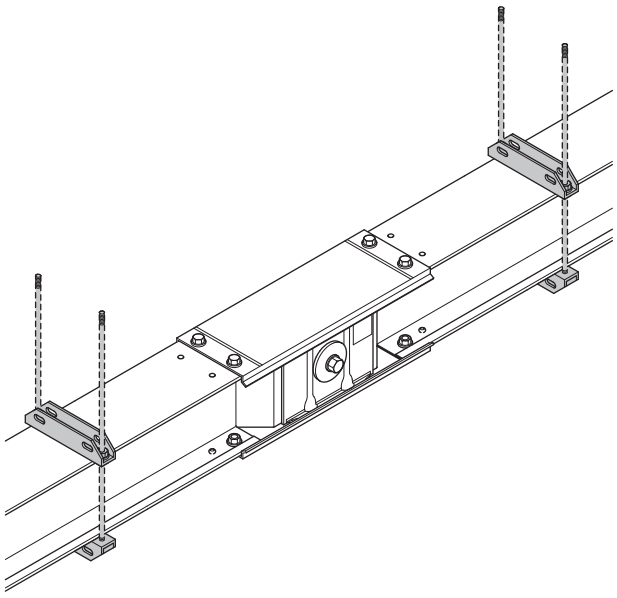
Supports Flatwise Installation
For flatwise installations, the maximum recommended distance between supports is 2000 mm. In addition, a support must be placed at a maximum distance of 750 mm from the joint block axis.



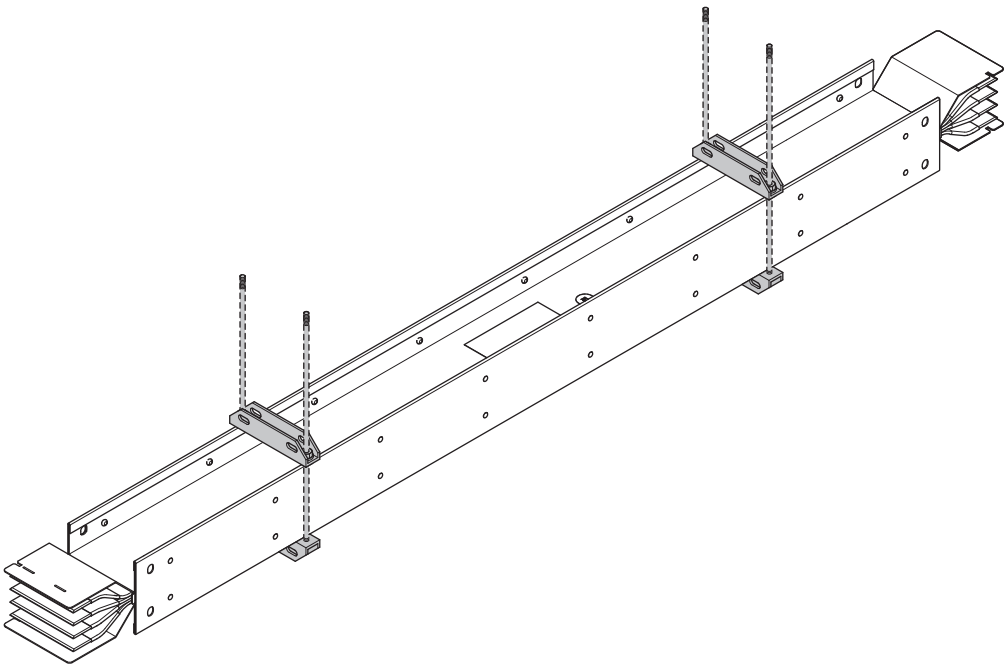
Consult always the general installation rules, before installing any type of support (see page 26)

Horizontal Supports
The function of horizontal supports is to correctly install path components horizontally and also adjust them along the length. Supports also have the function to absorb path componenets movements.

Types of Horizontal Supports

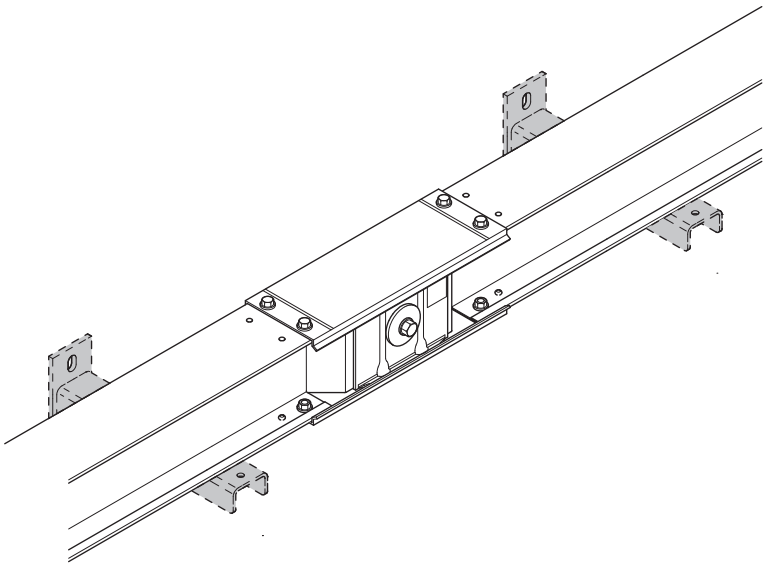


- Attached to the ceiling using 2x2 m threaded M10 rods (NOT provided within the busbar).
- Provide support for edgewise path components from the bottom.

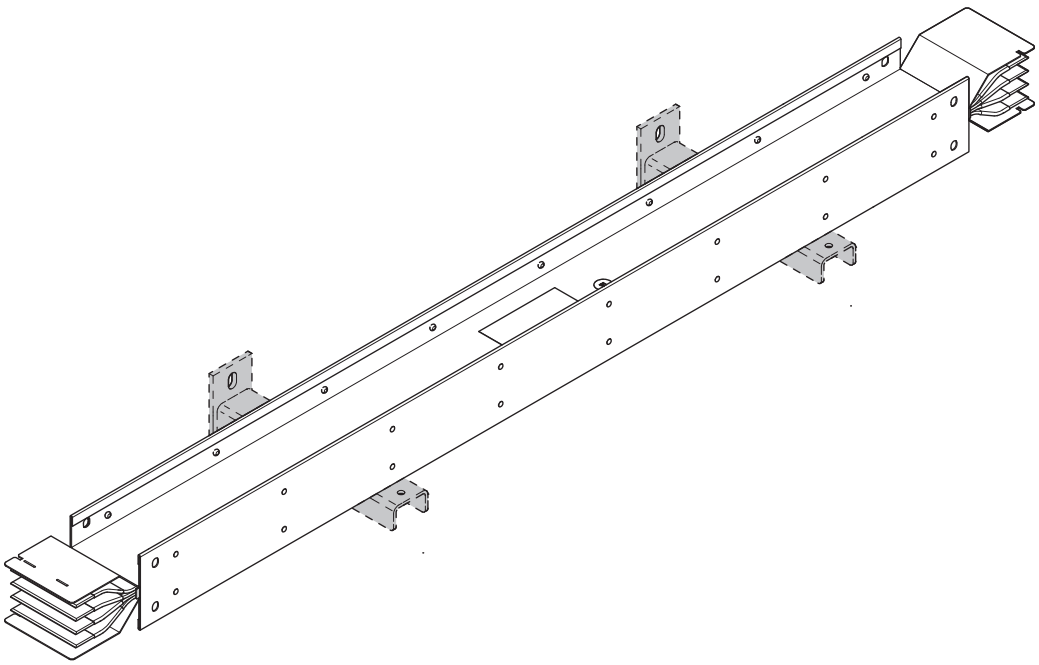


- Attached to the ceiling.
- Provide support for flatwise path components from the bottom.
- Supports are NOT provided within the busbar.

3. Installation



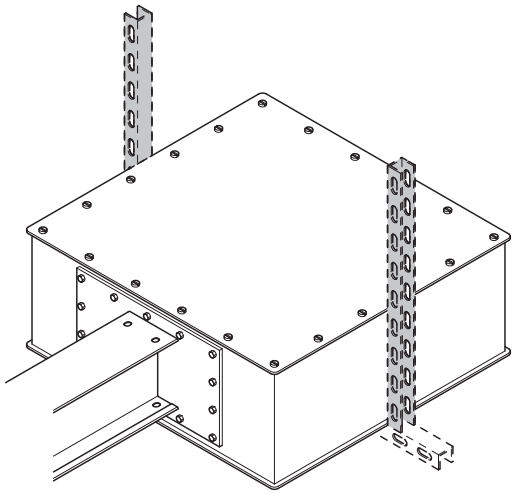
- Attached to the wall.
- Provide support for edgewise path components from the bottom.
- Supports are NOT provided within the busbar.



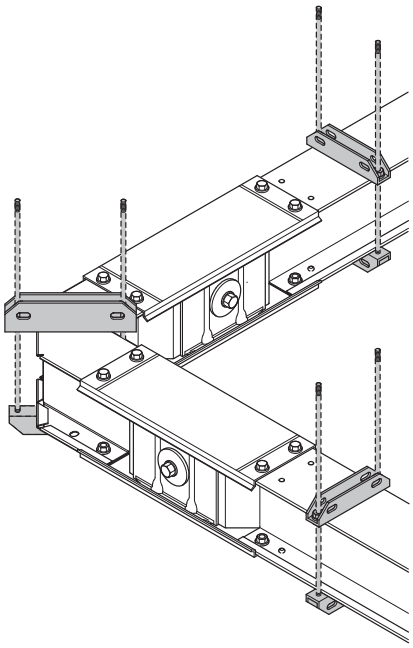
- Attached to the wall.
- Provide support for flatwise path components from the bottom.
- Supports are NOT provided within the busbar.
- Fixe the bar on the wall support.

WARNING
All the dihedral angle components must be supported at the point of the change of direction.

Use dedicated supports for components at the terminal ends of the path.
Be aware to have enough space to connect cables by customer.

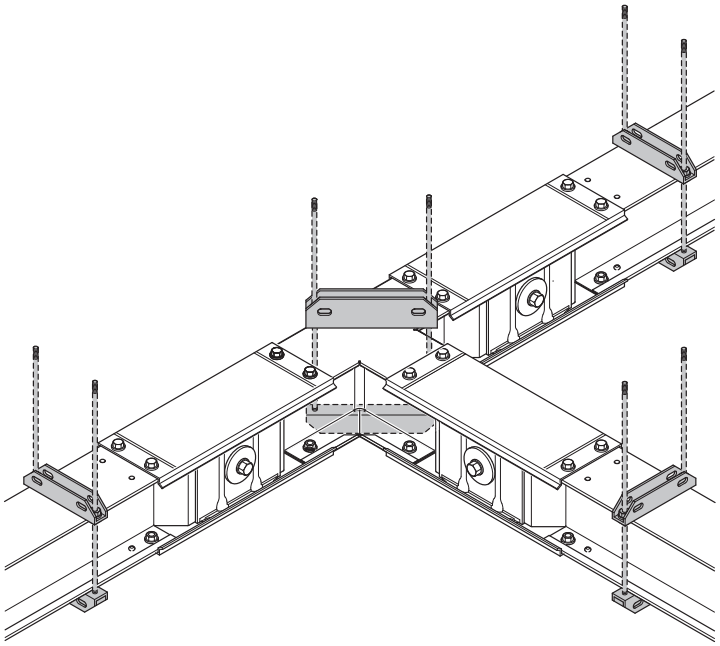


Supports for flatwise elbows components
Elbows components must have a support installed across the elbow angle.

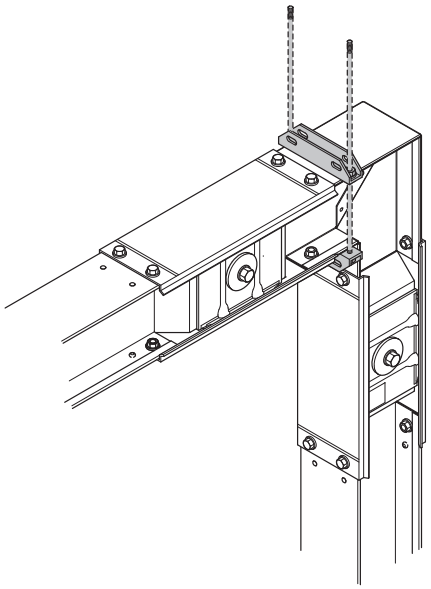


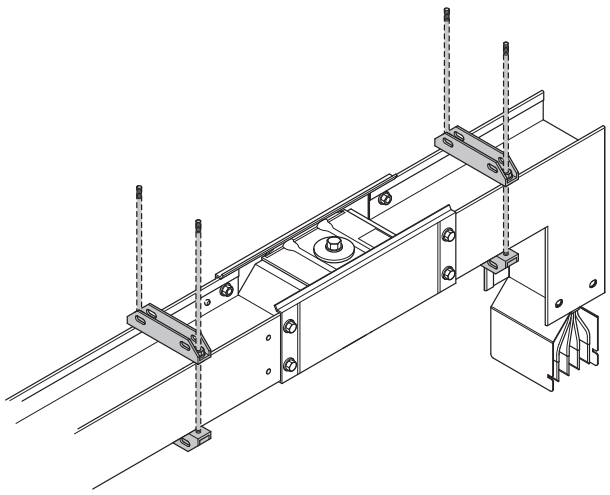
3. Installation

Supports for T components
T components must have a support installed across the T-joint.
Diagonal supports are not supplied.



Supports for edgewise elbow components with a vertical branch
Follow these rules to support edgewise elbows with a vertical branch.





3.2 Installation of wall supports

3.2.1 Installation sizes, distances and positioning logics

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

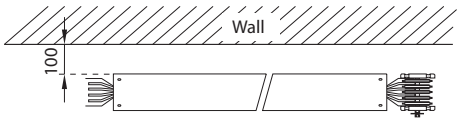
Minimum distances from the structure

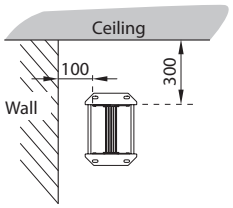
The minimum distance from the walls, to avoid problems during edgewise installation of the busbar, is 300 mm. The variables that must be taken into account for correct assembly are:

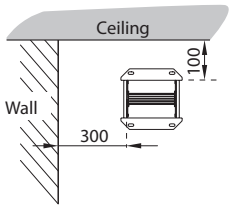
- position of the bolt for tightening the Monobloc; the minimum required distance is 100 mm;
- sizes of the distribution element (box) selected for the collection of power (at least 300 mm);
- any brackets and their assembly;
- accessibility to the screws for the installation of the brackets and the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

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

Minimum distance of the wall / ceiling elements

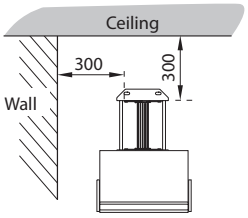


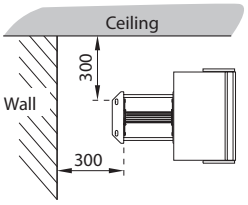


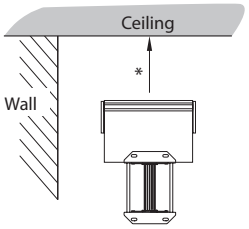


When there are tap-off units along the busbars, the minimum distances depend on the dimensions of the tap-offs selected.

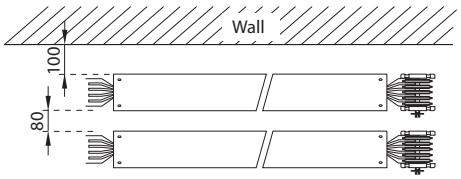
** When there is a tap-off box installed above the busbar, check the overall dimension of the open cover of the tap-off unit used in the specific section.*

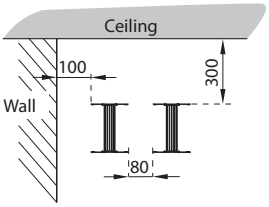




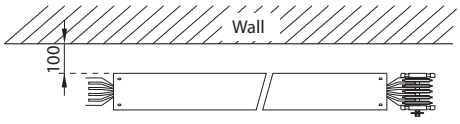


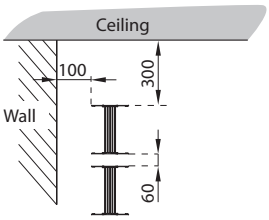
Minimum installation distance when there are several adjacent lines.





Minimum installation distance when there are several overlapped lines.

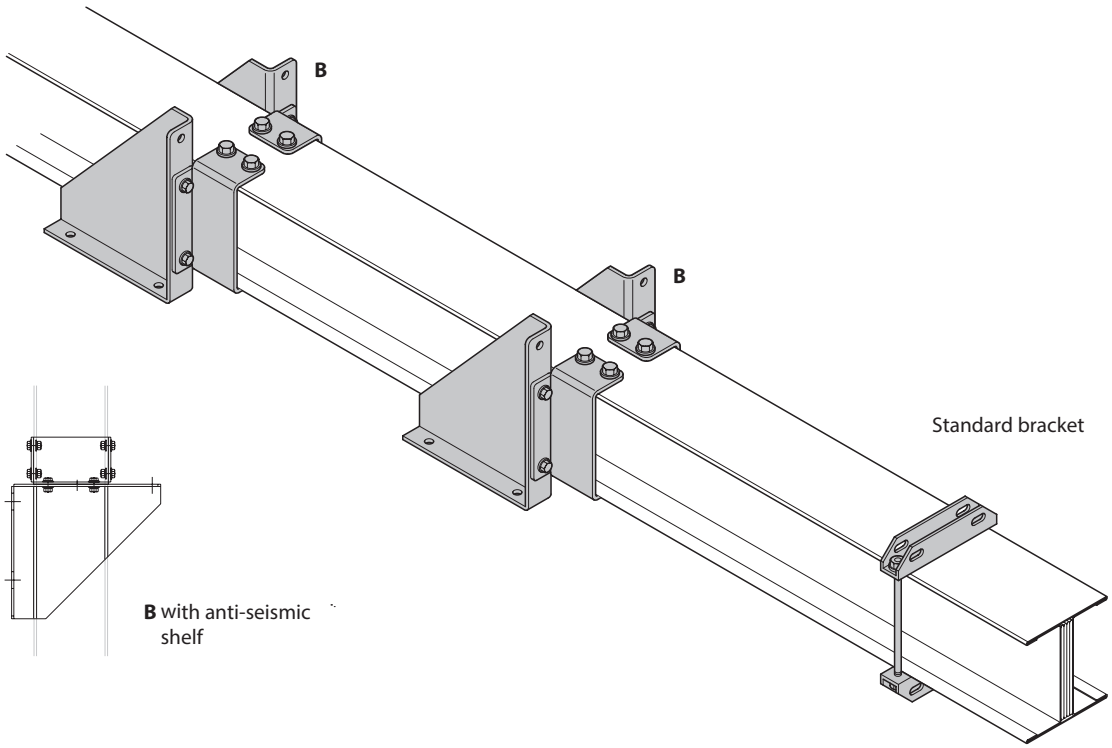




3. Installation

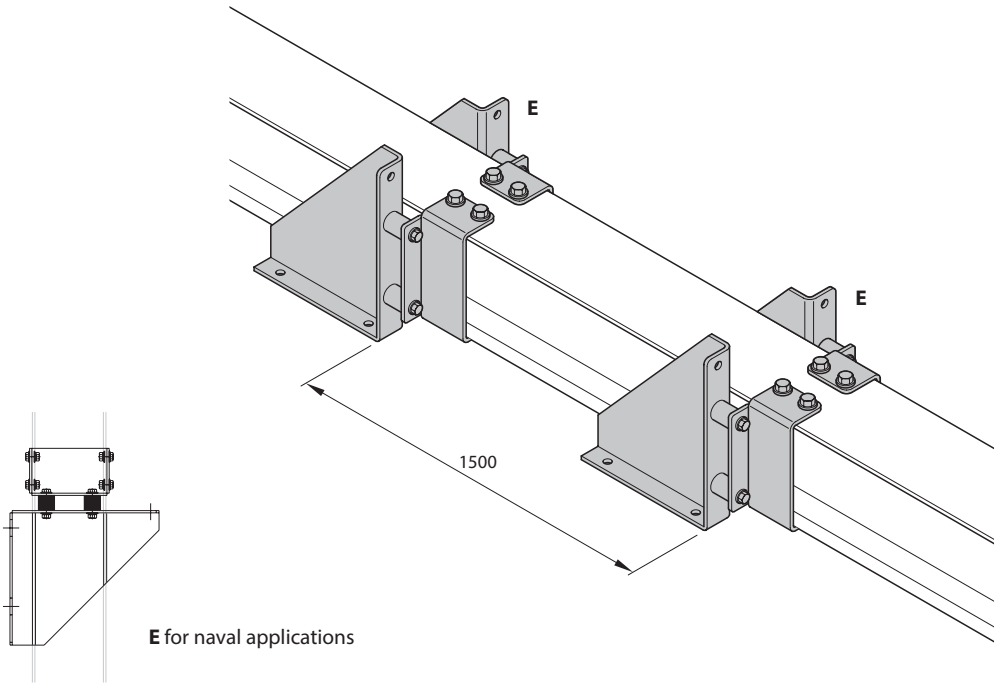
Fixing for installation in seismic environments in horizontal
Every 2 anti-seismic brackets with bracket (Type B), use one standard bracket.

Edgewise element.

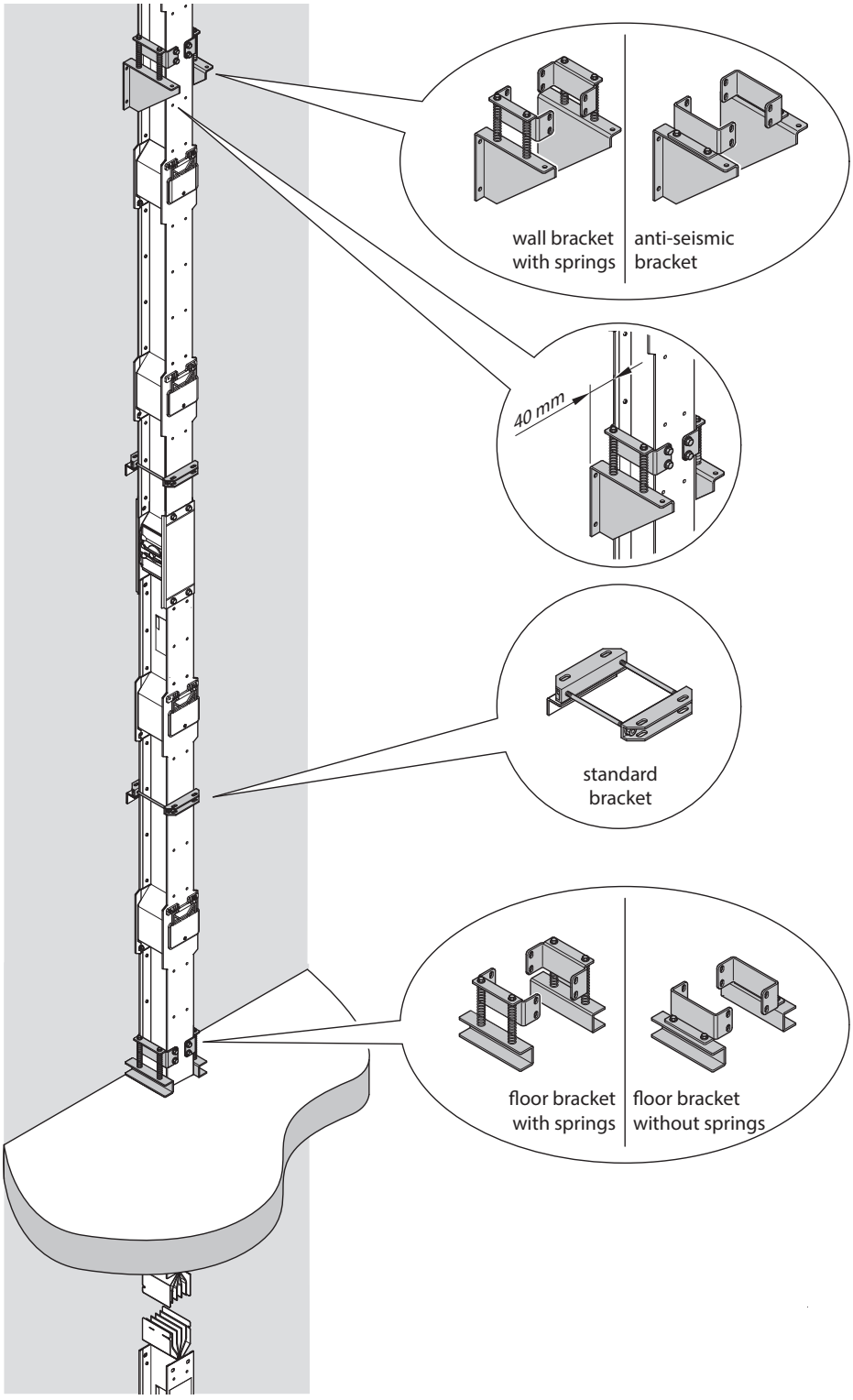


Fixing for naval installation
For naval installations always use a type E bracket.

Edgewise element.



3.3 Detailed instructions for vertical installation



When installing a vertical busbar, strictly follow the instructions below:

3.3.1 Definition of spring charging
3.3.2 Wall and floor drilling
3.3.3 Attaching the brackets to the busbars
3.3.4 Busbar mounting in line

3. Installation

3.3.1 Charging definition in brackets with springs

Depending on the capacity of the busbar, the quantity and the type of brackets being installed, check that the selected distance (D) is the same or less than the maximum distance (Dmax) between two subsequent brackets with springs.

XCP-S 4C Al		
In (A)	D max	Kit Springs
630	11	4
800	10	4
1000	10	4
1250	9	4
1600	10	6
2000	9	6
2500	12	8
3200	11	12
4000	10	12
5000	8	12

XCP-S 4C Cu		
In (A)	D max	Kit Springs
800	9	4
1000	8	4
1250	7	4
1600	6	4
2000	6	6
2500	9	8
3200	7	8
4000	7	12
5000	5	12
6300	4	12

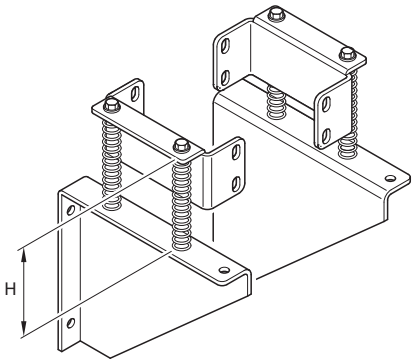
For 5C version multiply Dmax by 0.9
For 3C version multiply Dmax by 1.1

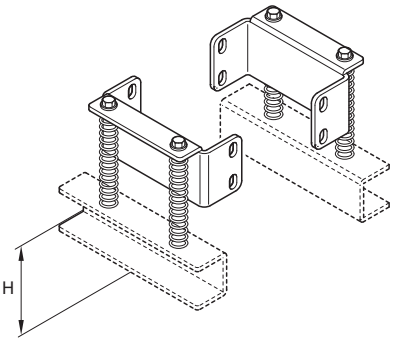
XCP-HP 4C Al		
In (A)	D max	Kit Springs
630	10	4
800	10	4
1000	10	4
1250	9	4
1600	7	4
2000	9	6
2500	11	8
3200	11	12
4000	10	12
5000	8	12

XCP-HP 4C Cu		
In (A)	D max	Kit Springs
800	9	4
1000	7	4
1250	7	4
1600	6	4
2000	6	6
2500	5	6
3200	6	8
4000	6	12
5000	5	12
6300	4	12

For 5C version multiply Dmax by 0.85
For 3C version multiply Dmax by 1.1

If D≤Dmax, calculate the spring **H CHARGING** value:





$$H = 130 - \frac{(Wb \cdot D + Wacc)}{(3 \cdot n)}$$

Where:
- **Wb:** busbar linear weight [kg/m]
- **D:** actual distance between two brackets with springs [m]
- **Wacc:** sum of the weights of all the accessories connected between two brackets with springs (boxes, cables, etc.) [kg]
- **n:** total number of springs in the brackets (see previous table)
- **H:** charging [mm]. CAUTION: H should be between 105 and 130 mm

Calculation example:

TYPE OF BUSBAR: S-4C-Cu (Pe2)
In [A]: 800
Dmax [m]: 9
D [m]: 7
BUSBAR [kg/m]: 23,3
BOX WEIGHT 1 [kg]: 18
BOX WEIGHT 2 [kg]: 12

$$H = 130 - \frac{23{,}3 \cdot 7 + (18 + 12)}{3 \cdot 4} = 113{,}9 \text{ mm}$$

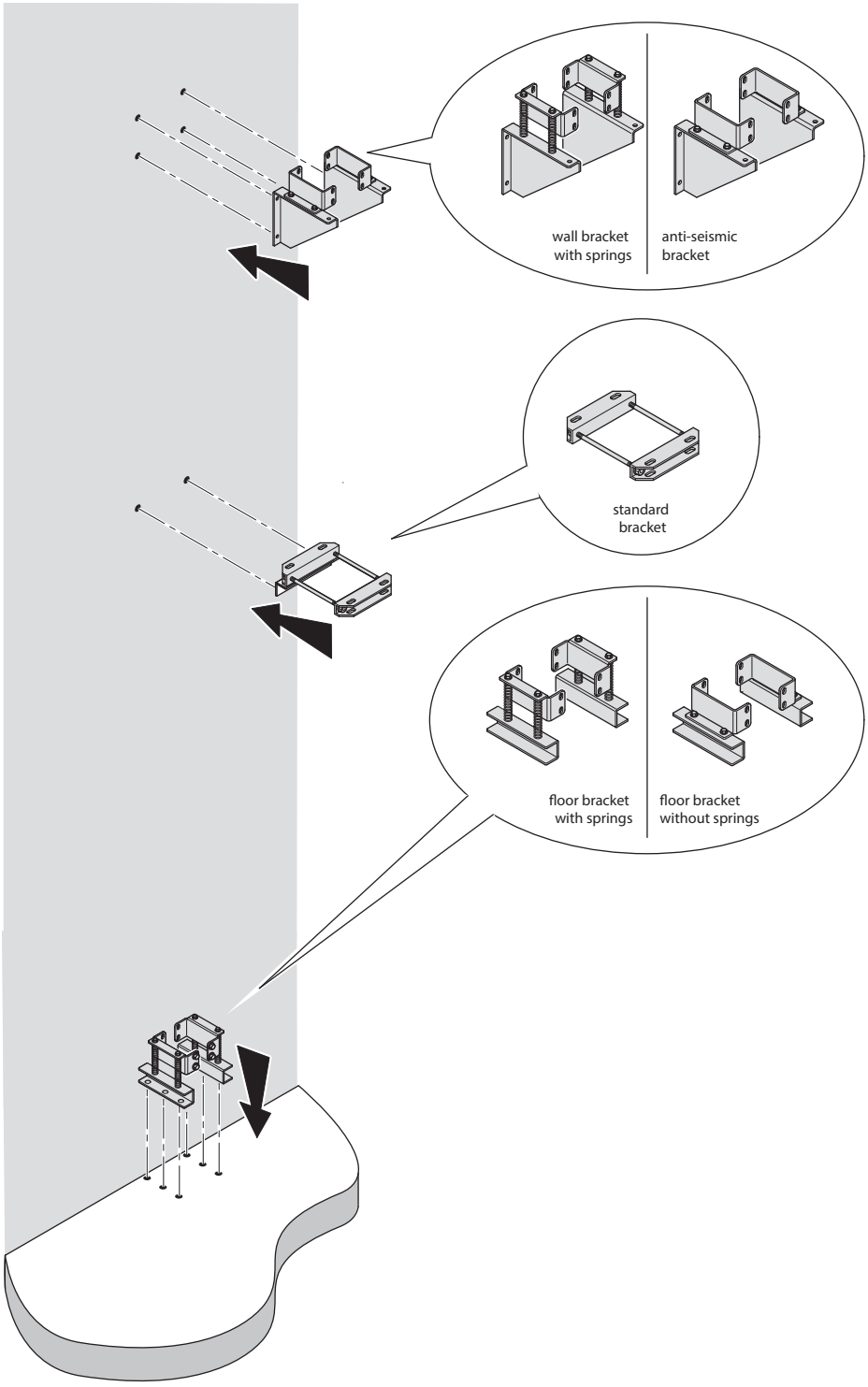
TYPE OF BUSBAR: S-5C-Al (Pe1)
In [A]: 2000
Dmax [m]: 9X0,9=8,1
D [m]: 6
BUSBAR [kg/m]: 29,6
BOX WEIGHT 1 [kg]: 18
BOX WEIGHT 2 [kg]: 12

$$H = 130 - \frac{29{,}6 \cdot 6 + (18 + 12)}{3 \cdot 6} = 118.5 \text{ mm}$$

3. Installation

3.3.2 Wall and floor drilling

Drill the required floor and wall holes for fixing all the brackets

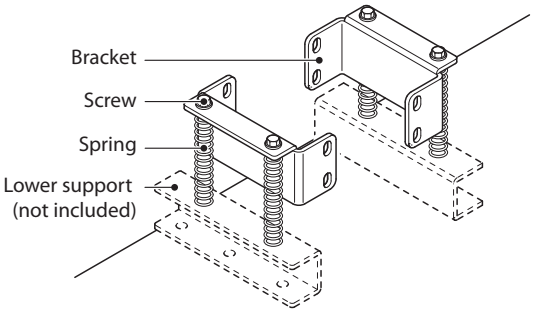


Below are the procedures for drilling the holes for each type of bracket.

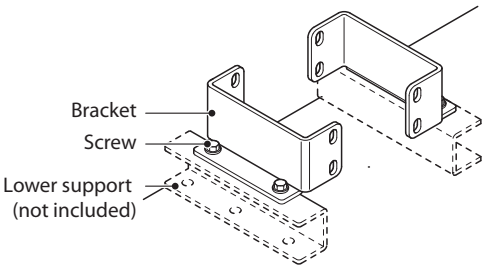
3.3.2.1 Floor bracket with/without springs

The bottom supports (dashed shapes) are not included with the brackets, but are available to order.

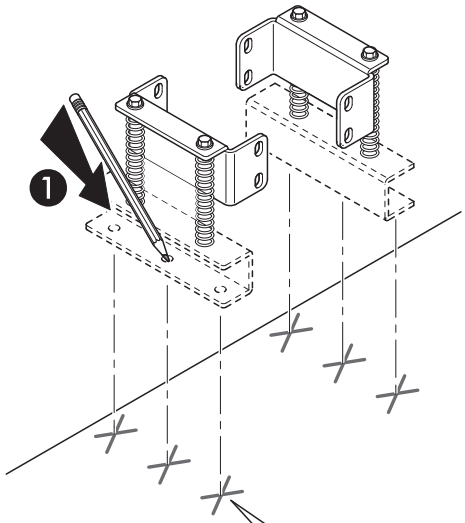
Floor bracket with springs (type C)

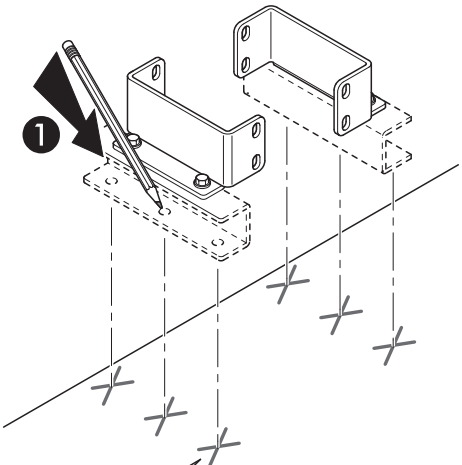


Floor bracket without springs (type D)

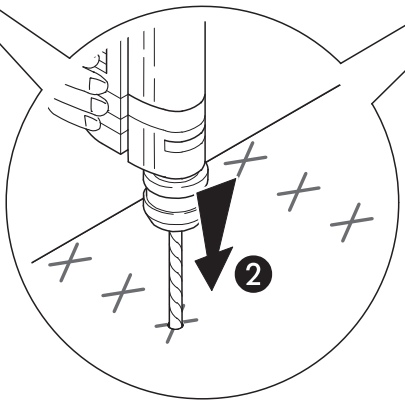


1) On the floor, mark the holes of the bottom supports at the point where the busbar must be secured.





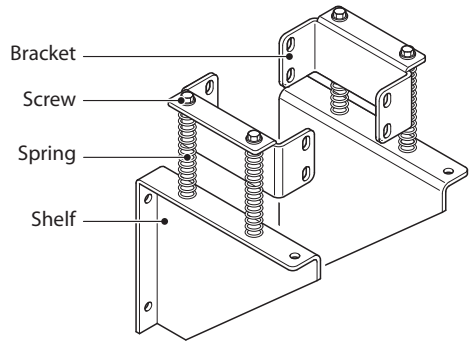
2) Drill the floor at the marked positions.



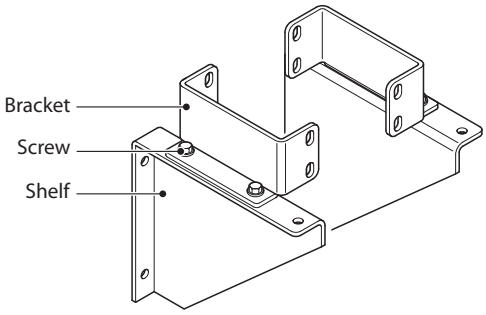
3. Installation

3.3.2.2 Wall bracket with springs and anti-seismic bracket

Wall bracket with springs (type A)



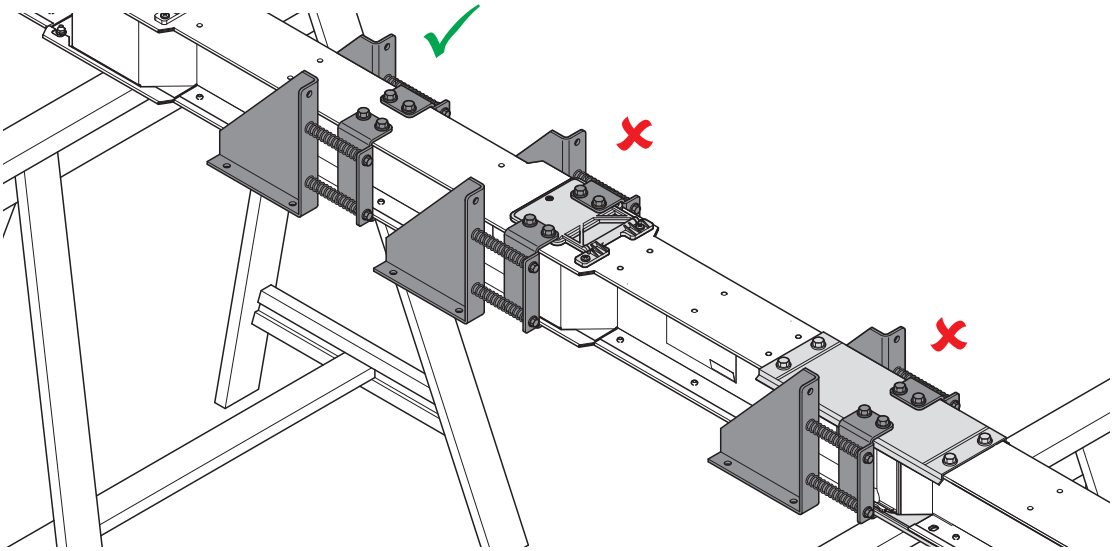
Anti-seismic wall bracket (type B)



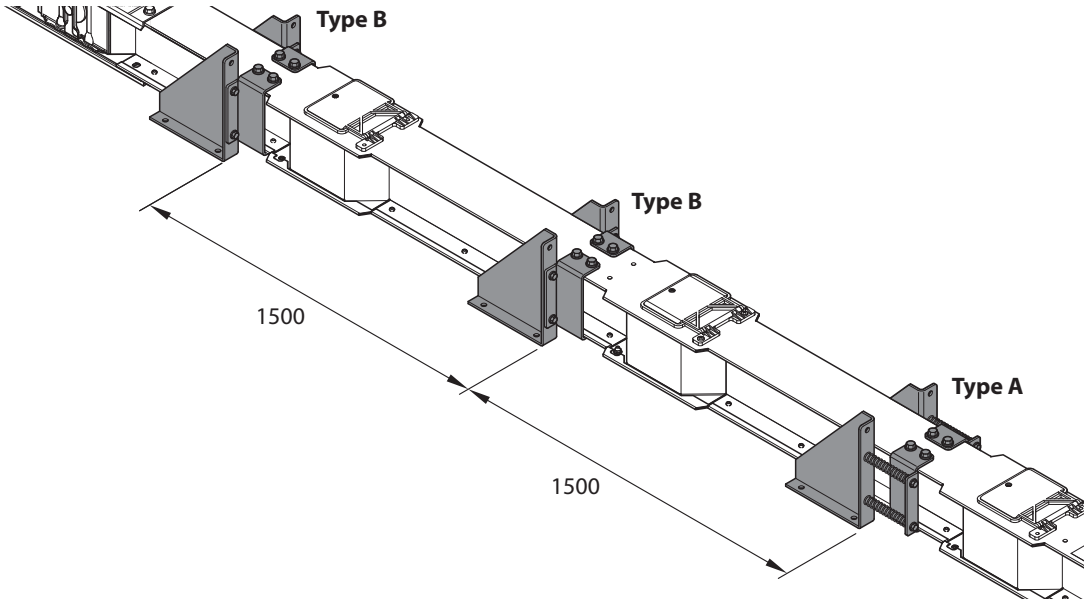
WARNING

Do not position the bracket nearby branching, joining ports and tap offs.

1) Set the bracket position on the busbar.

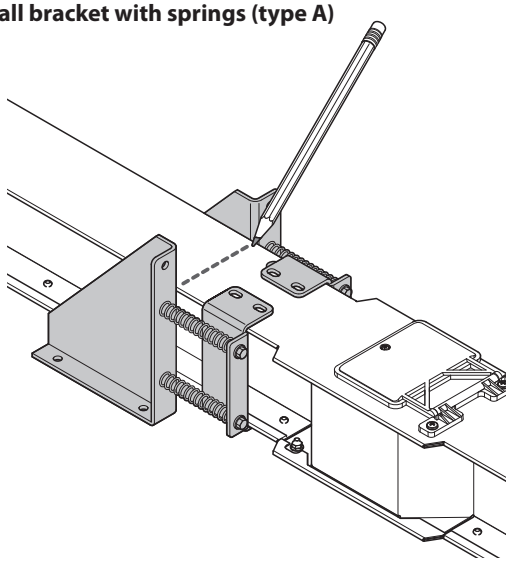


In case of anti-seismic busbars (Type B), fit one bracket every 1.5 m along the busbar.
Fit one bracket with springs (Type A) every two anti-seismic brackets (Type B).

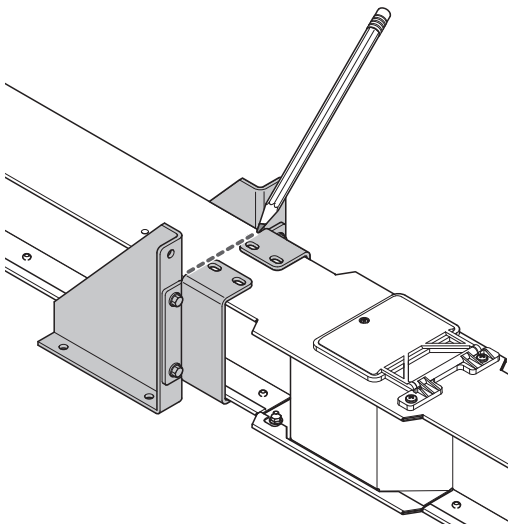


2) Place the bracket on the busbar at the fixing position and mark the upper side of the shelf.

Wall bracket with springs (type A)



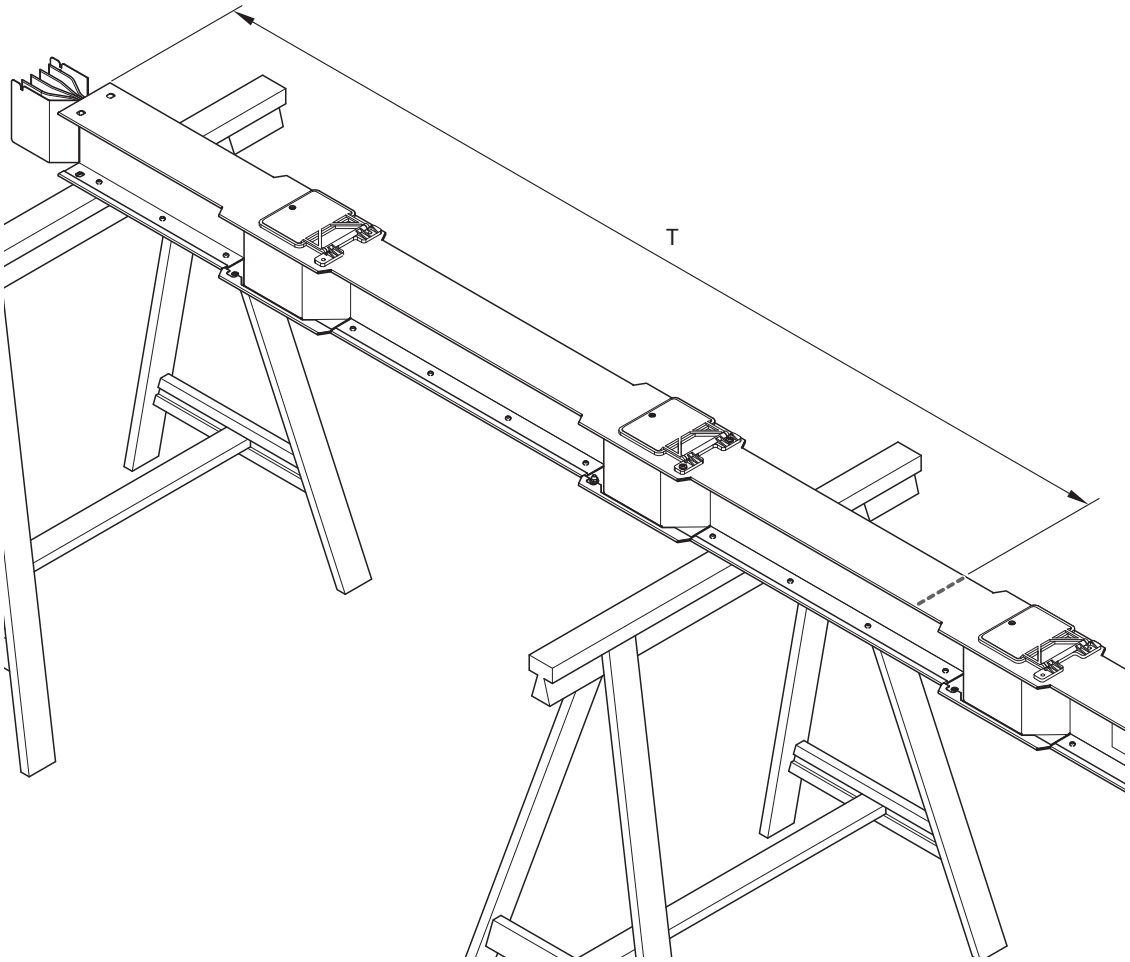
Anti-seismic wall bracket (type B)



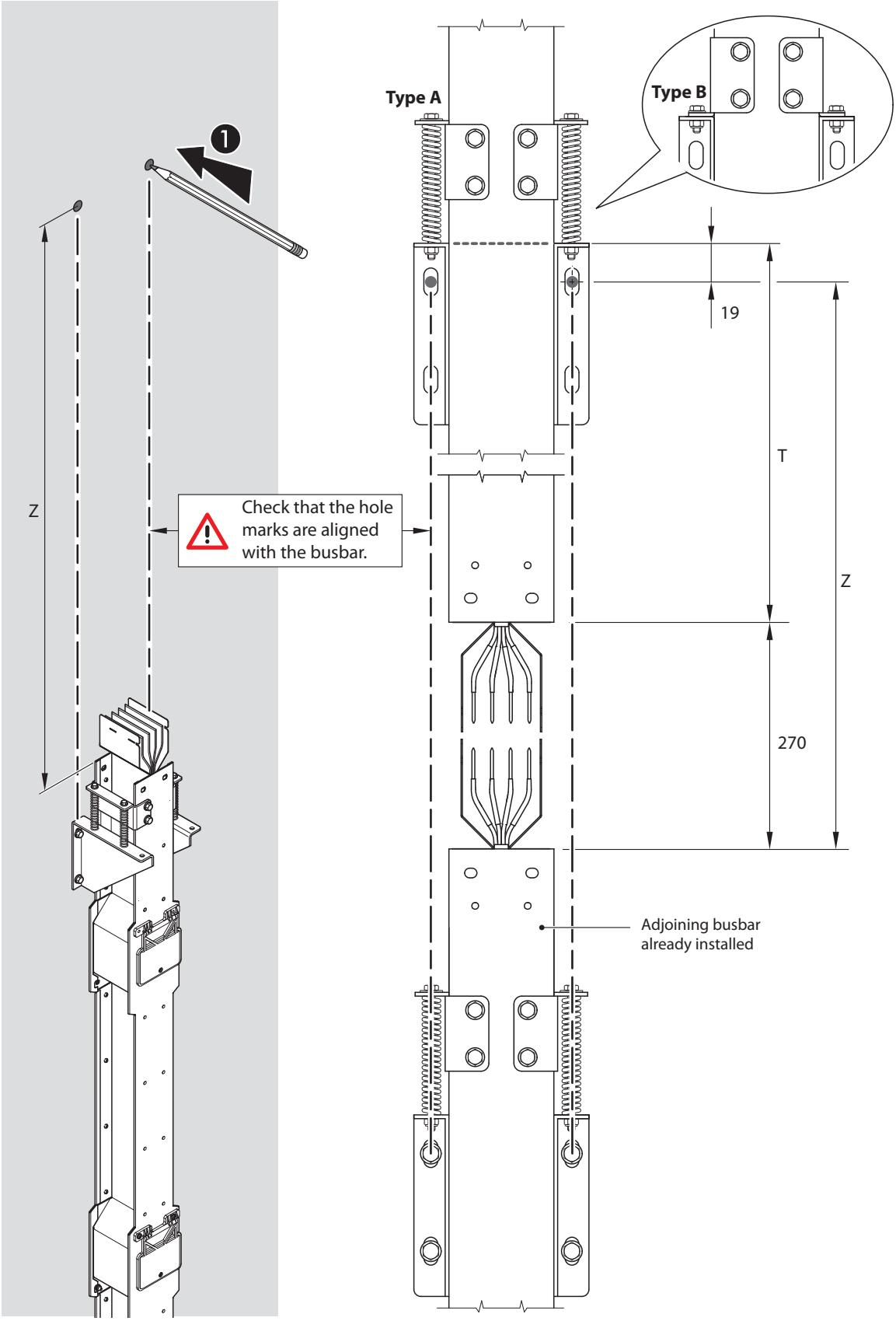
3. Installation

WARNING
The measurement must be from the busbar cap and not the bars.

3) Measure the distance T from the mark just made to the bottom cap of the component.



4) On the wall, mark the position Z of the two upper holes of the shelves (indicated in the magnified view), calculated as follows:
Z= T-19+270
(measurements in millimeters).

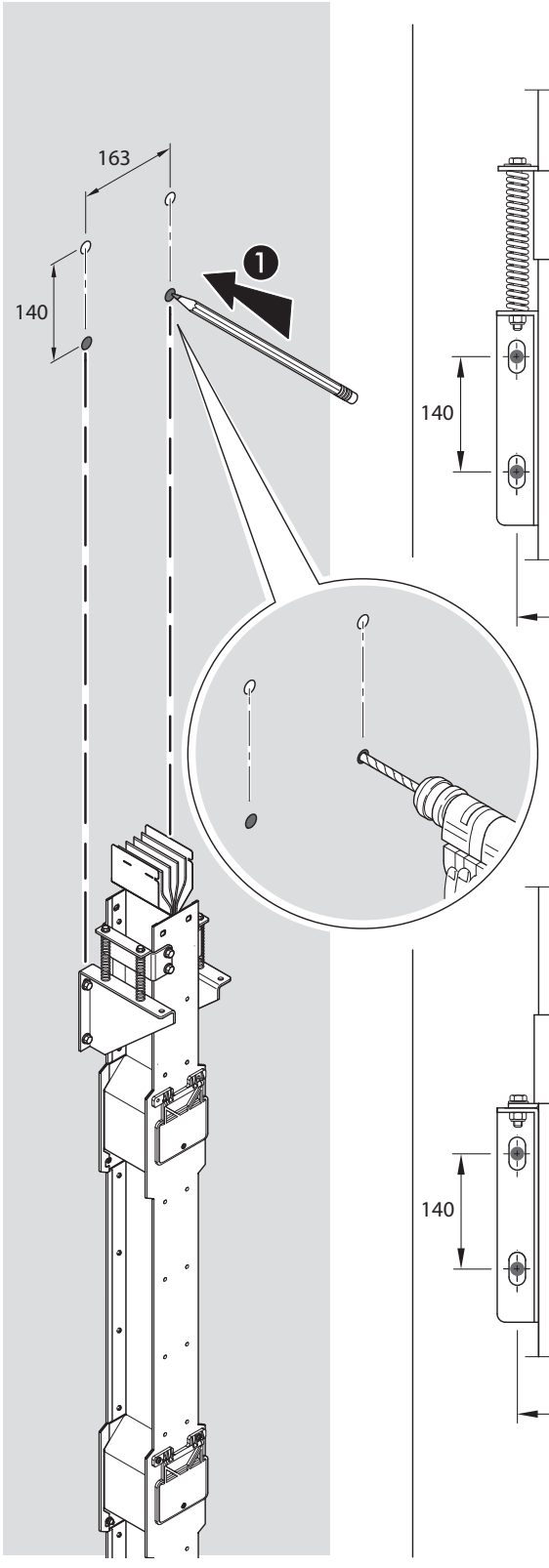


3. Installation

WARNING

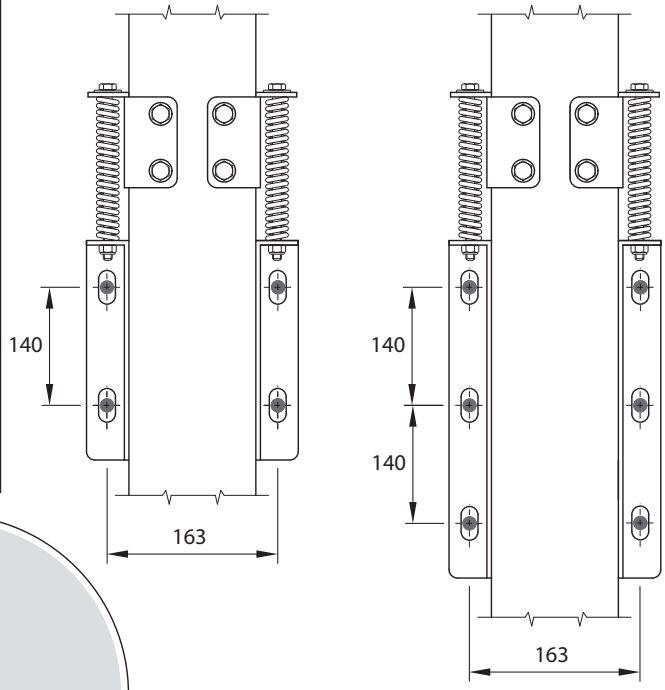
The Z value must be measured from the upper cap of the already installed adjoining busbar.

5) On the wall, mark the positions of the bottom holes of the shelves, in accordance with the values below.

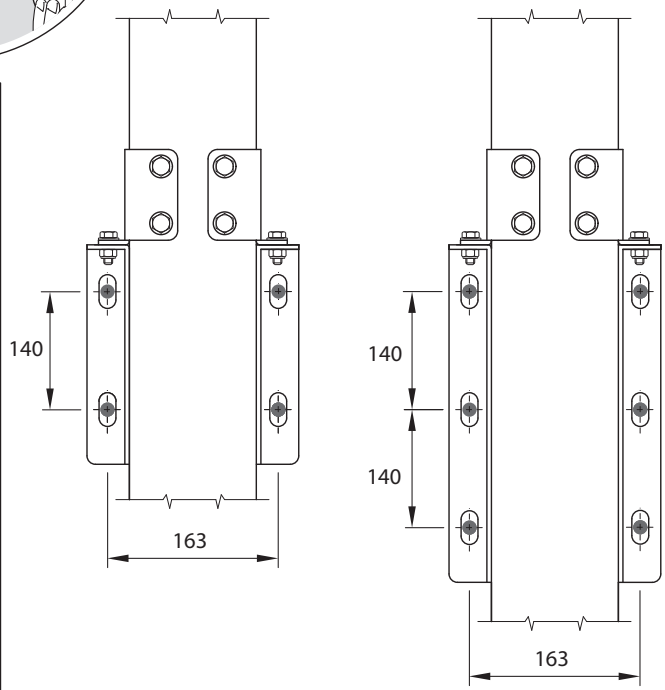


6) Drill the holes at the marked positions. Check that the hole marks are aligned with the busbar.

Wall bracket with springs (type A)

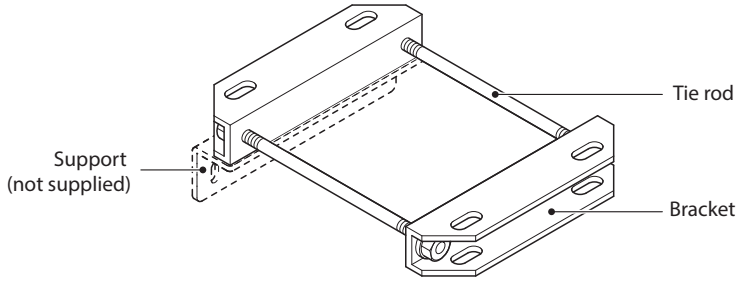


Anti-seismic bracket (type B)



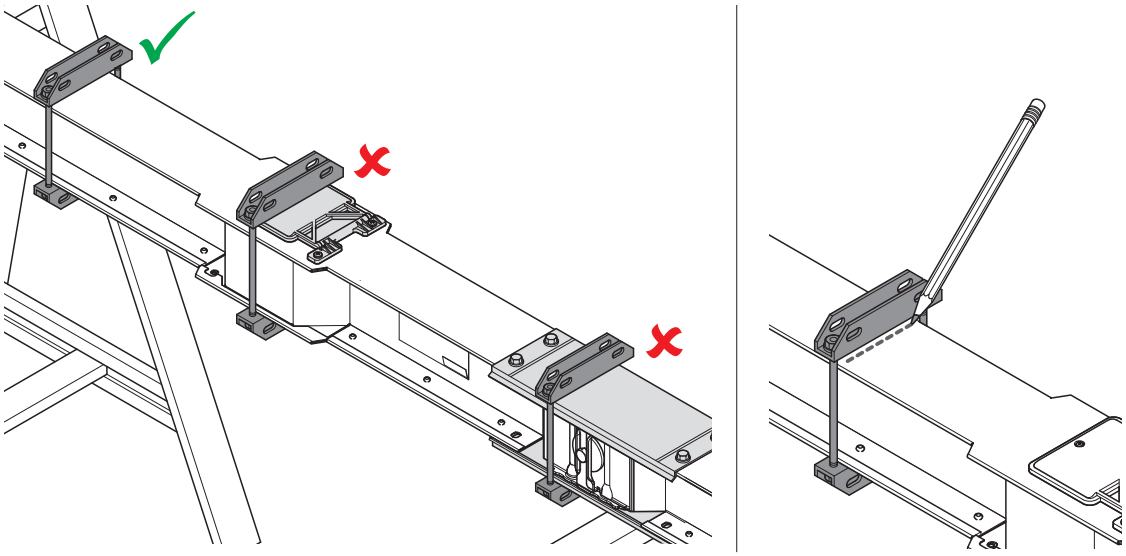
3.3.2.3 Standard bracket

The bottom support (dashed shape) is not supplied.



1) Set the bracket position on the busbar.

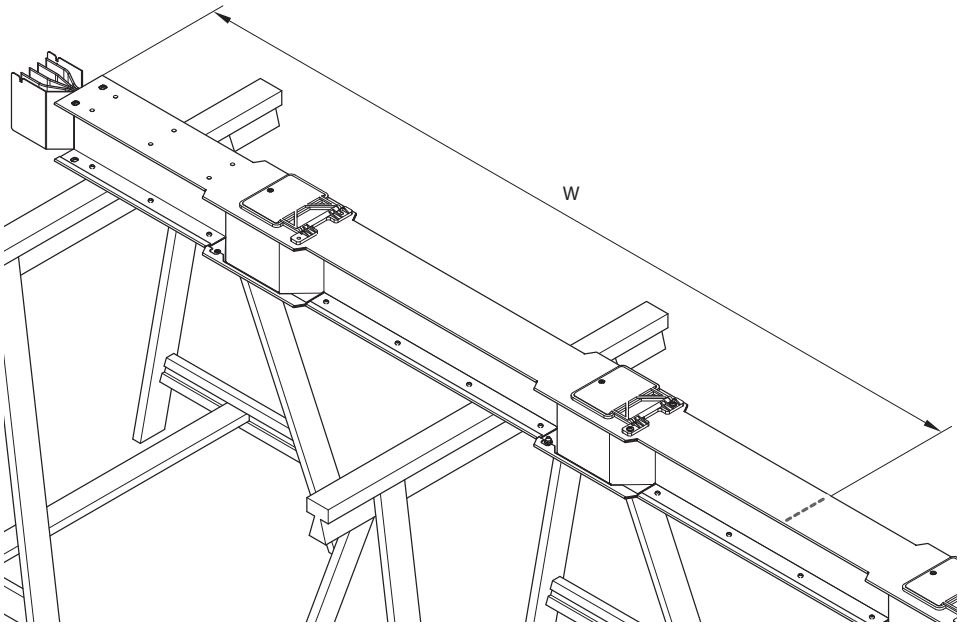
WARNING
Do not position the bracket nearby branching and joining ports.



2) Place the bracket on the busbar and mark its upper side.

3) Measure the distance W from the mark just made to the bottom cap of the busbar.

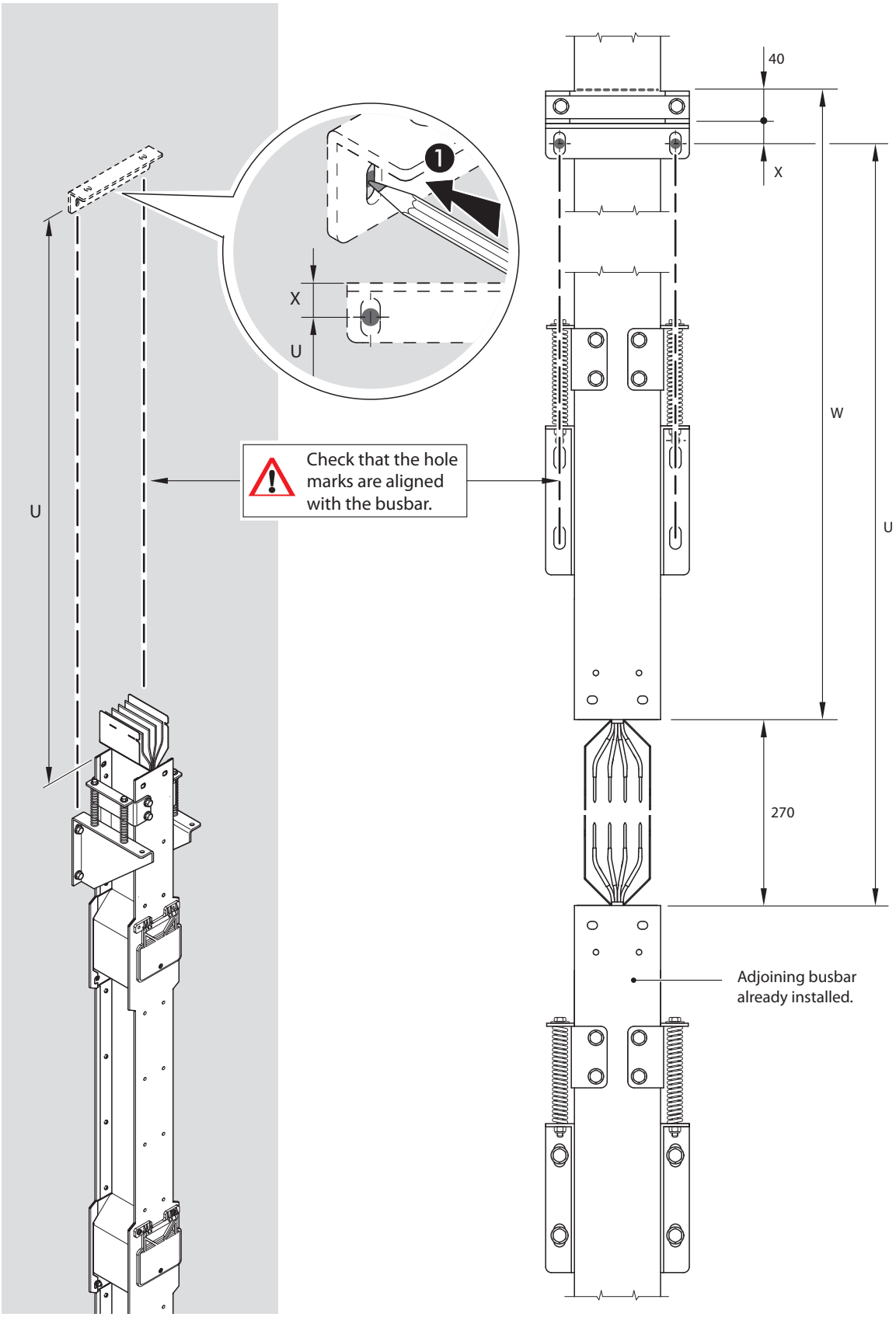
WARNING
The measure-ment must be from the busbar cap and not the bars.



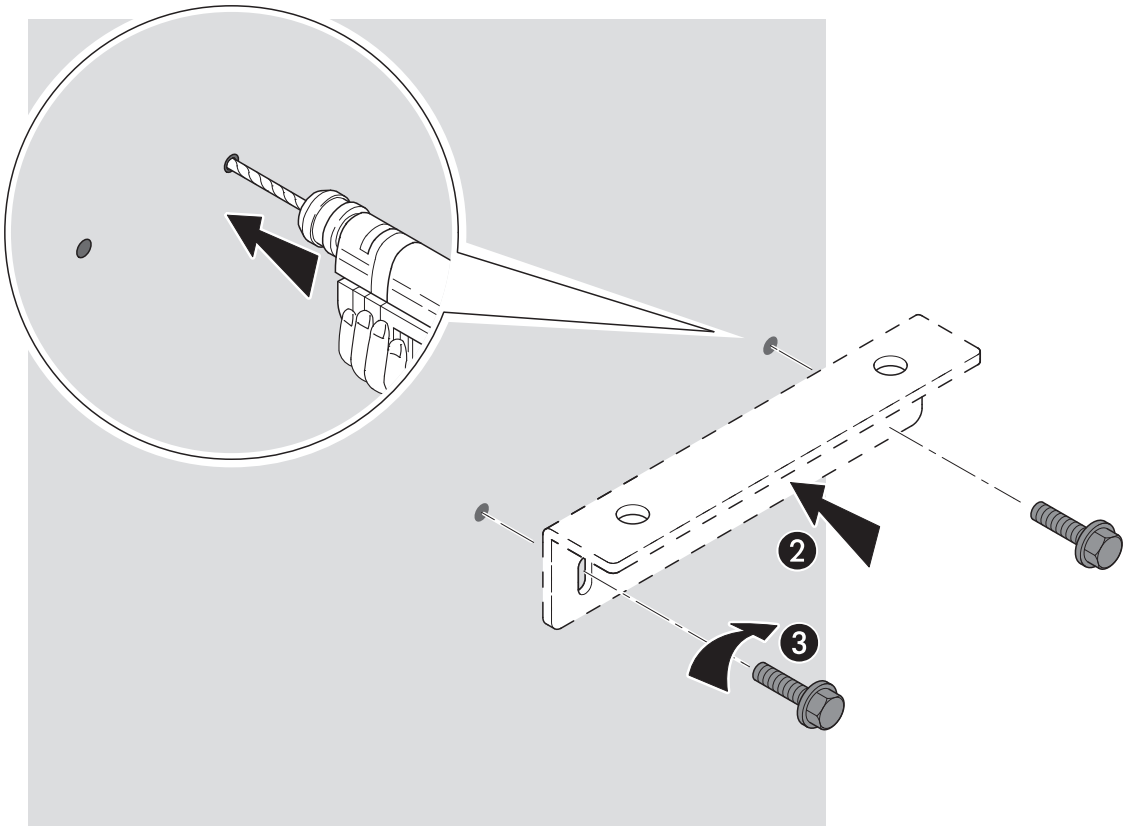
3. Installation

4) On the wall, mark the position U for fixing the bottom support, calculated as follows: U= W+270-40-X (measurements in millimeters).

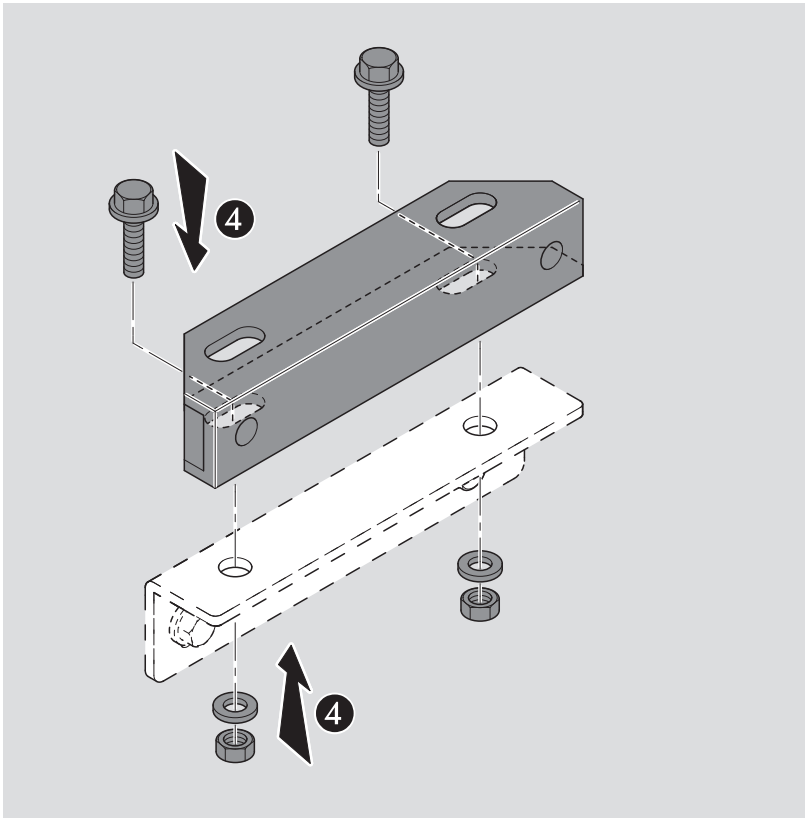
WARNING
The U value must be measured from the upper cap of the already installed adjoining busbar.



5) Drill the wall and fix the bottom bracket support.



6) Attach the bracket to the bottom support.

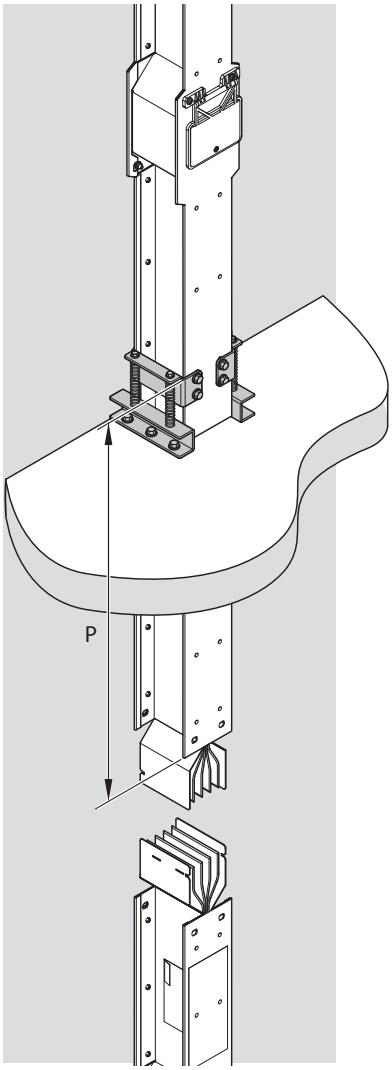


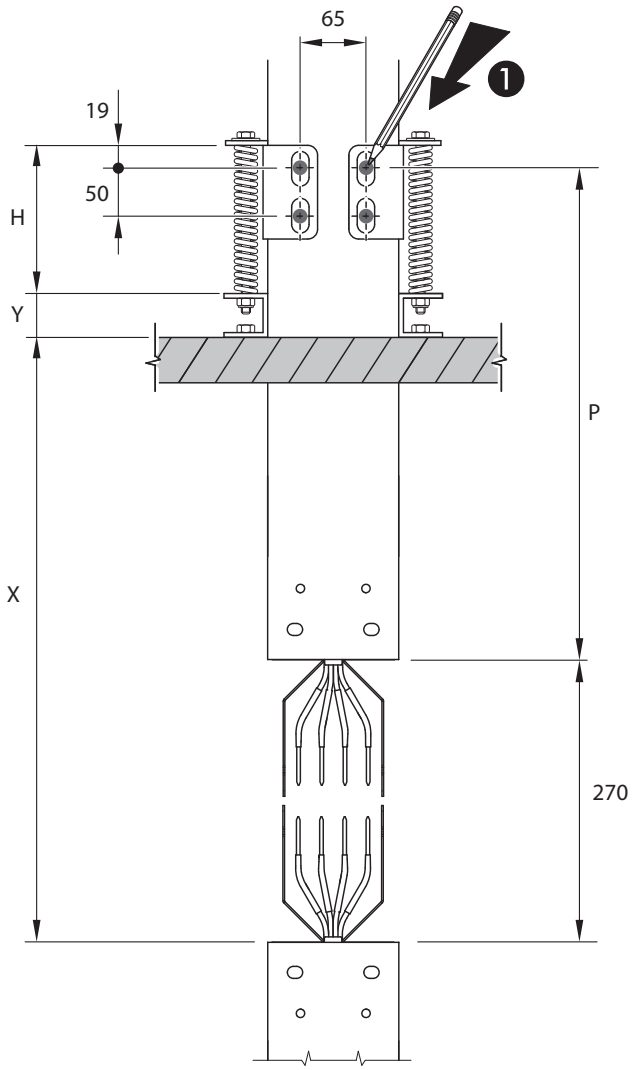
3. Installation

3.3.3 Attaching the brackets to the busbars

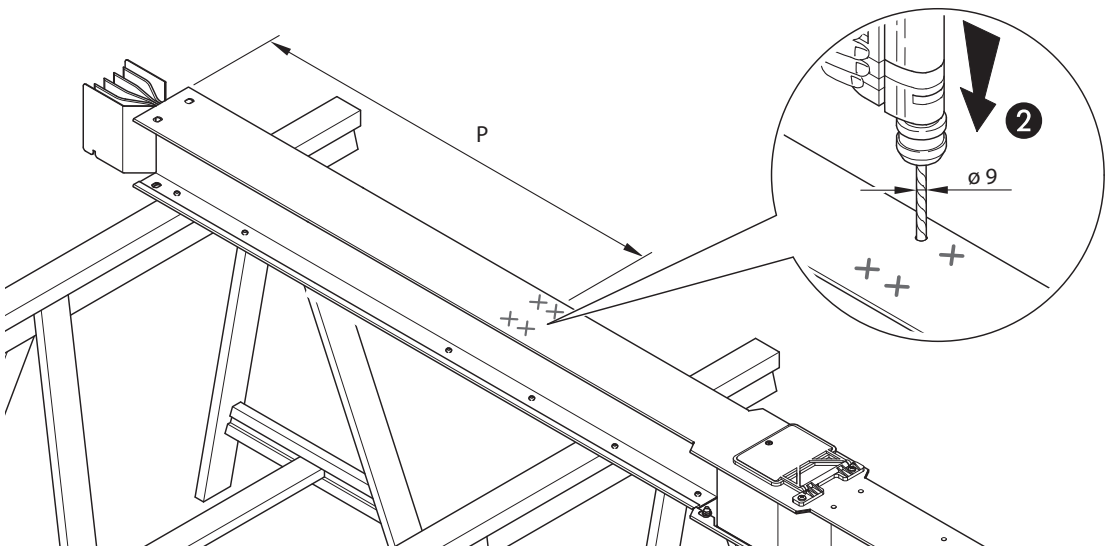
3.3.3.1 Floor bracket with springs

1) Mark the four bracket holes on the busbar in accordance with the following values: P=X+Y+H-270-19 (measurements in millimeters).

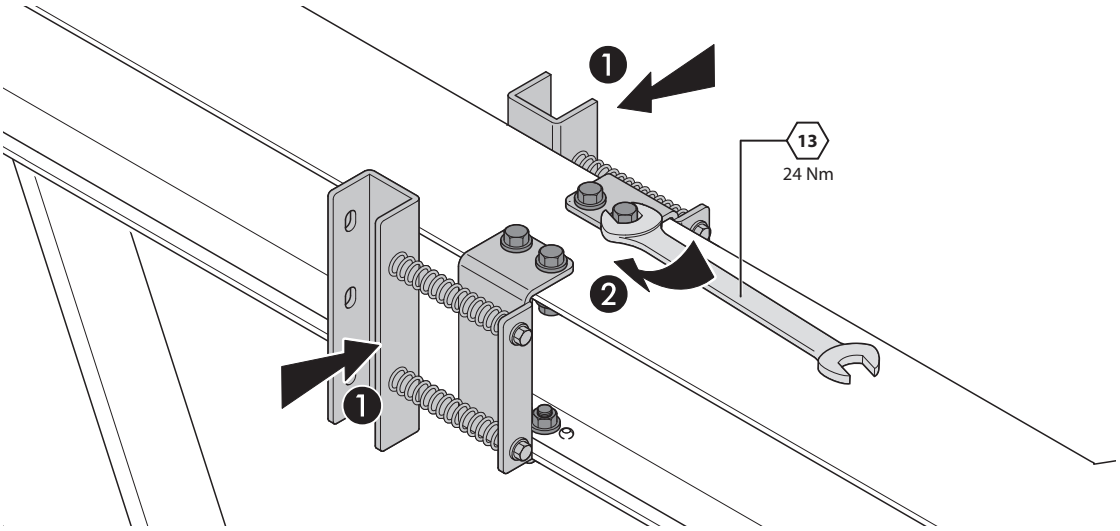




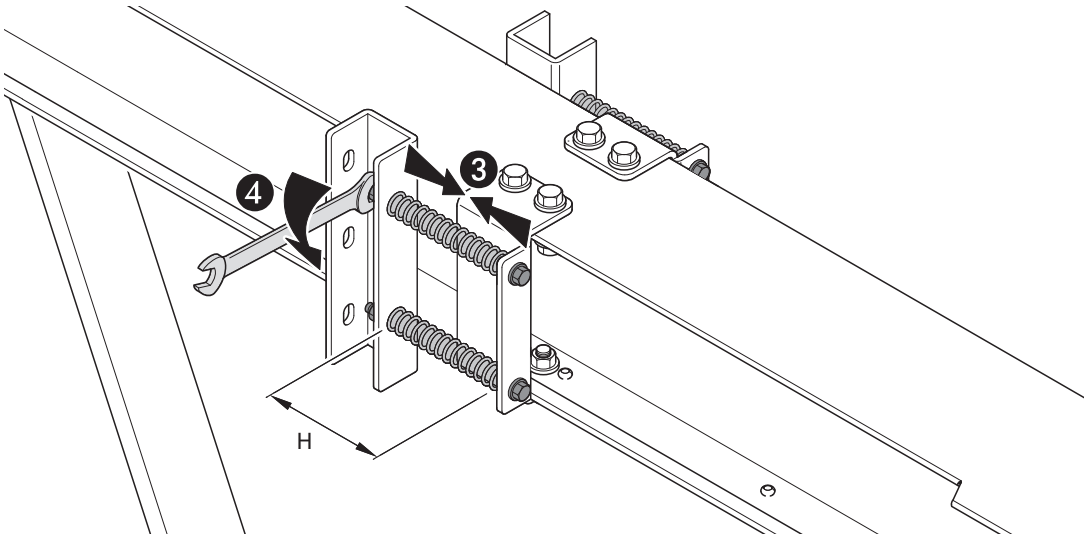
2) Drill the busbar at the four marks just made: HOLE ø = 9mm.



3) Screw the bracket to the busbar with a torque of 24 Nm.



4) Tighten the nuts, bringing the spring to the CHARGING distance H as previously defined (page 38).

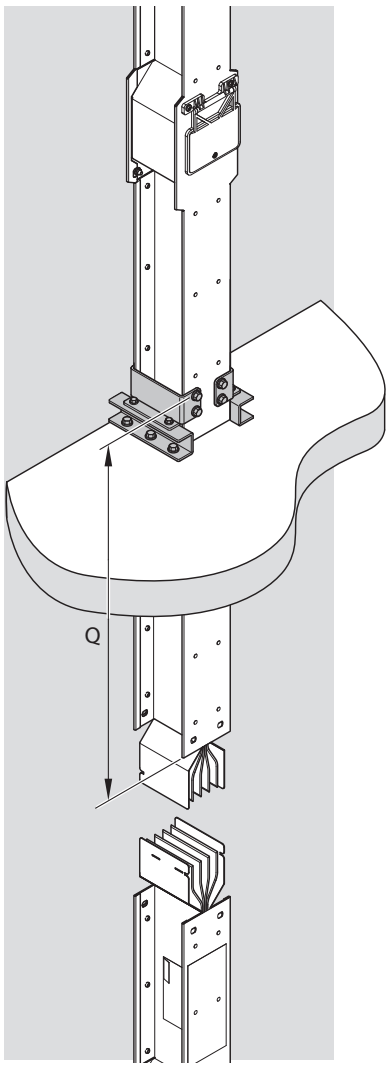


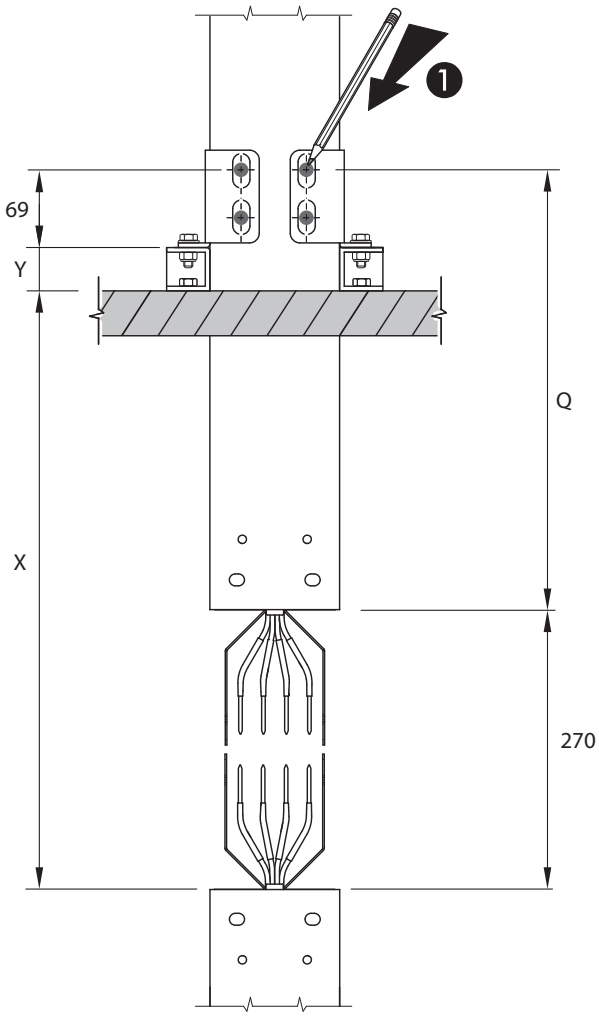
In case of need, contact Starline technical service.

3. Installation

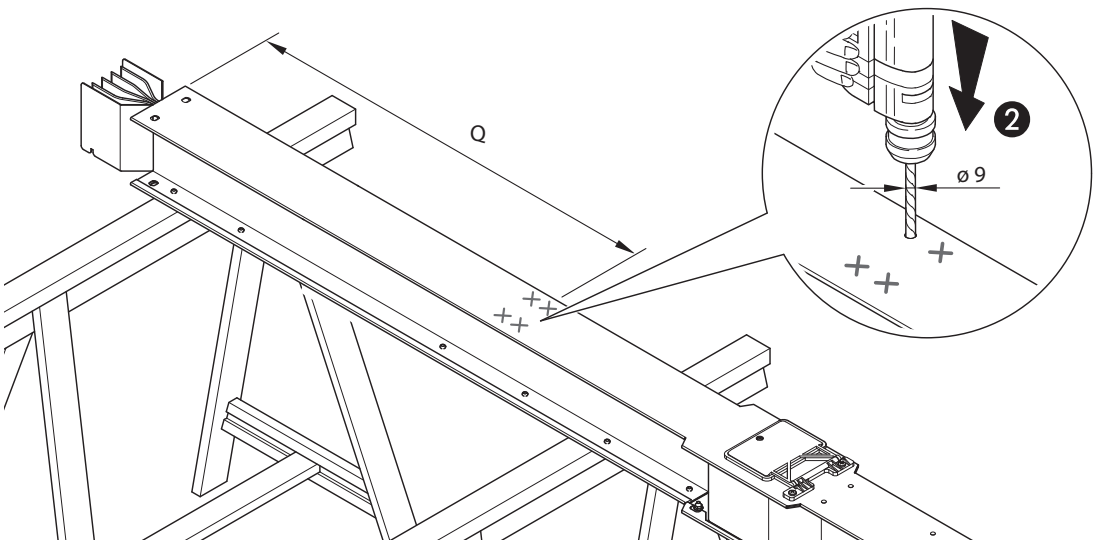
3.3.3.2 Floor bracket without springs

1) Mark the four bracket holes on the busbar in accordance with the following values: Q=X+Y+69-270 (measurements in millimeters).

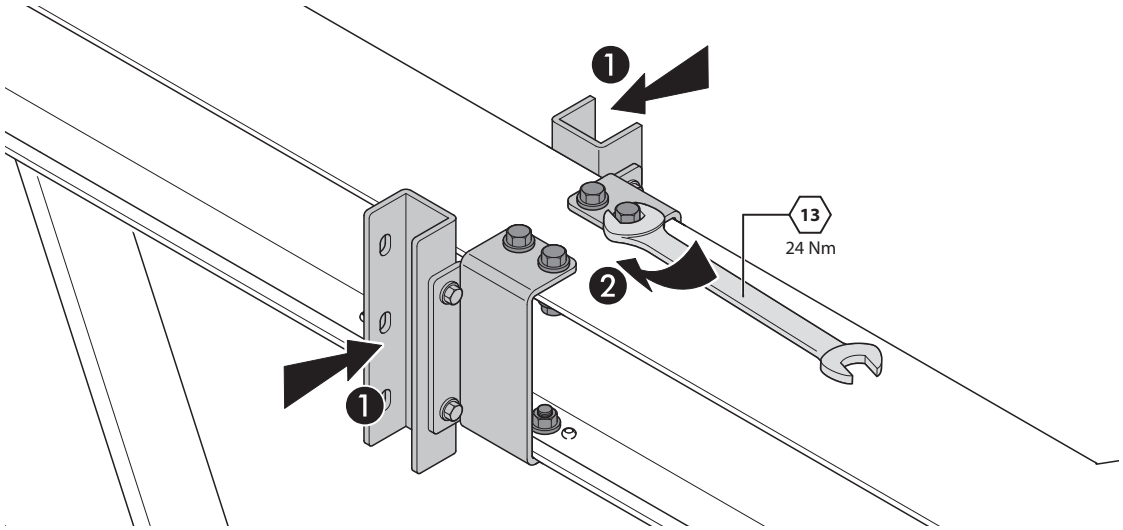




2) Drill the busbar at the four marks just made: HOLE ø = 9mm.



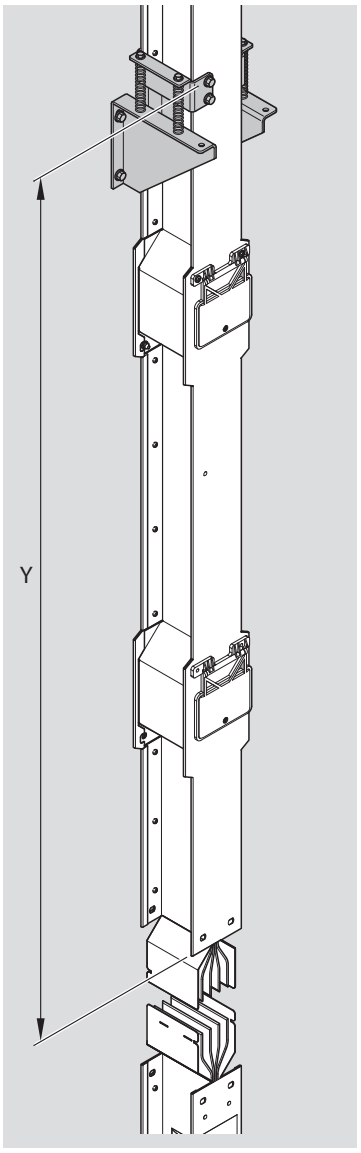
3) Screw the bracket to the busbar with a torque of 24 Nm.

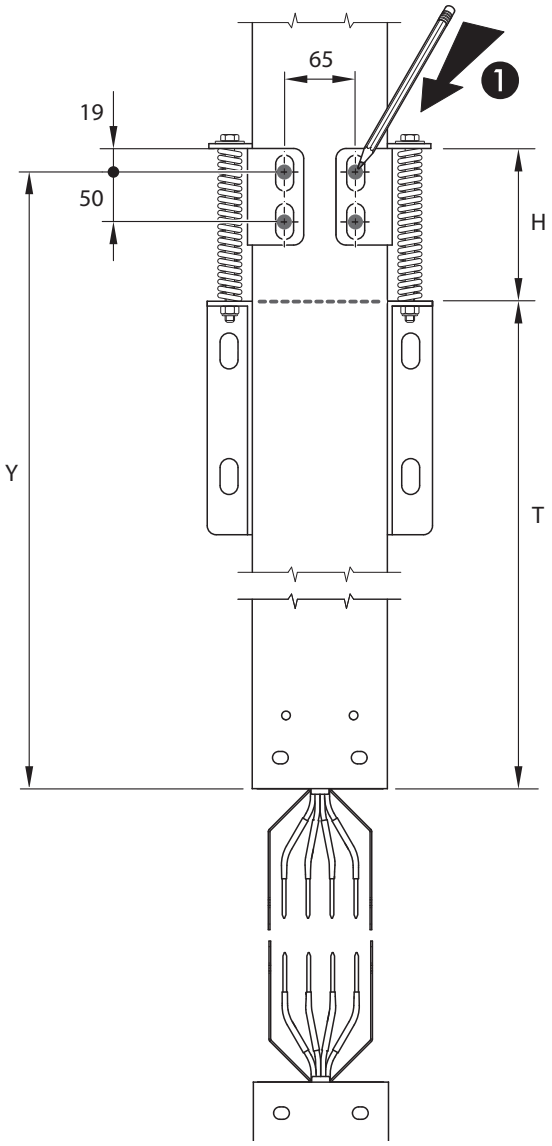


3. Installation

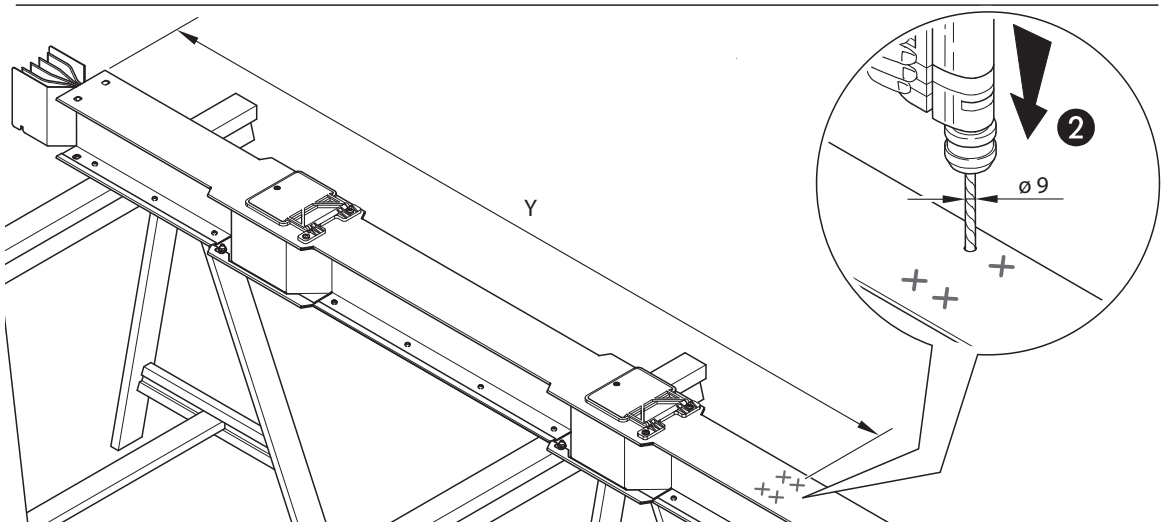
3.3.3.3 Wall bracket with springs

1) Mark the four bracket holes on the busbar, calculated as follows Y=T+H-19 (measurements in millimeters).

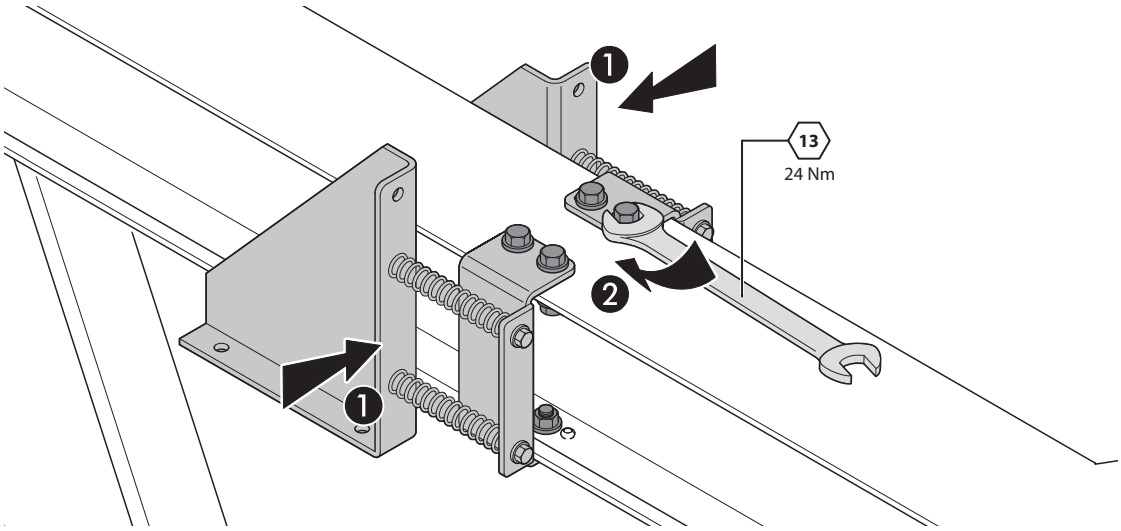




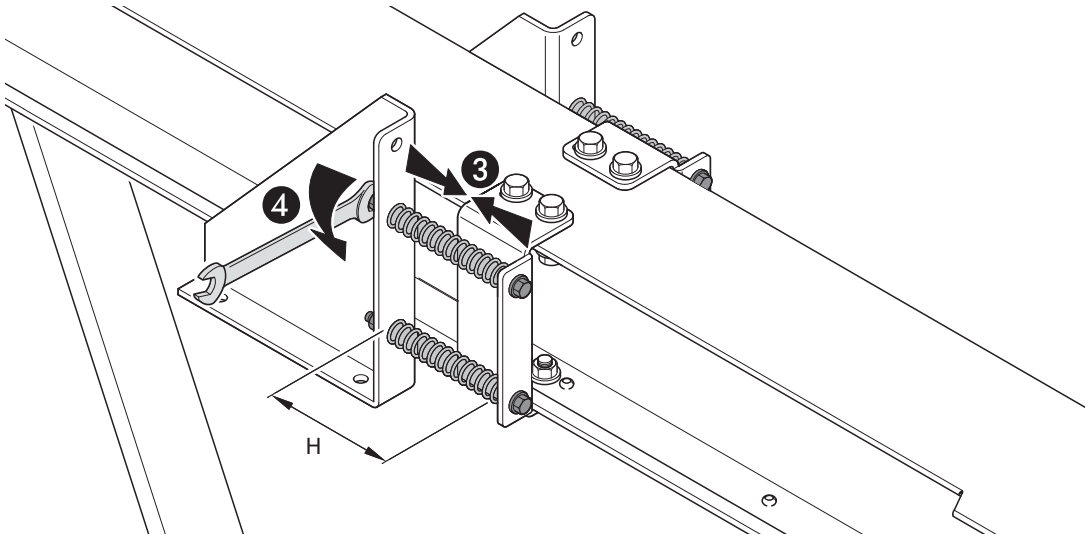
2) Drill the busbar at the marks just made: HOLE ø = 9mm.



3) Screw the brackets to the busbar with a torque of 24 Nm.



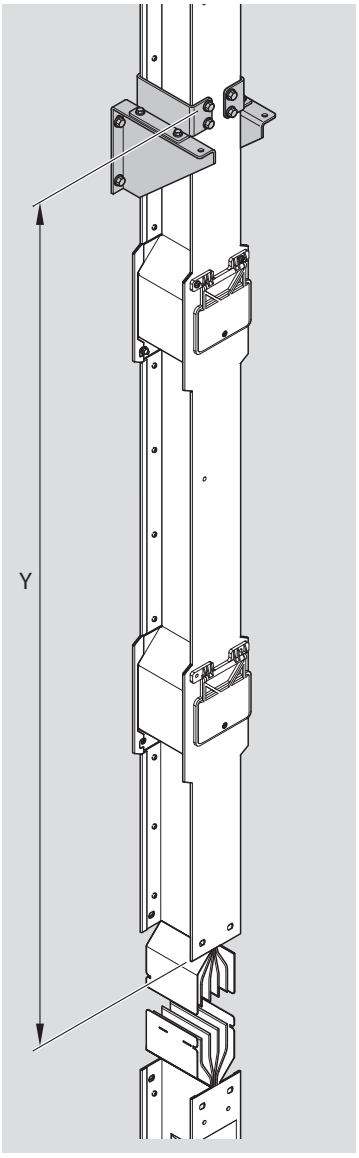
4) Tighten the nuts, bringing the spring to the CHARGING distance H as previously defined (page 35).

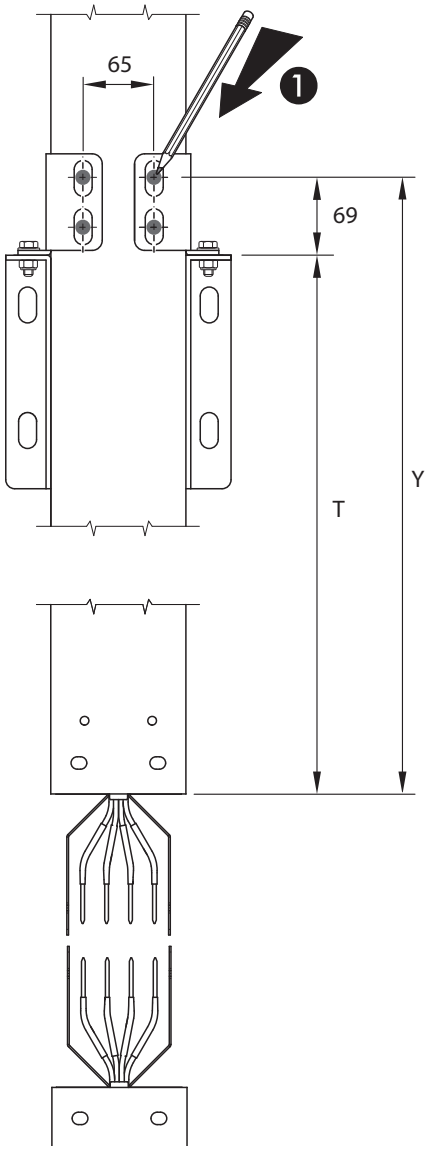


3. Installation

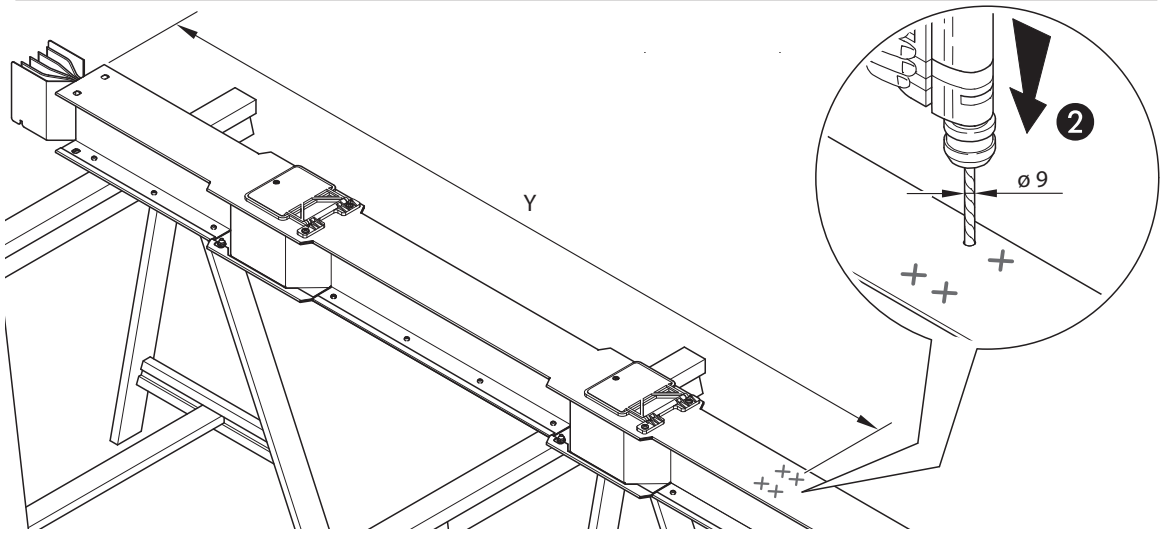
3.3.3.4 Anti-seismic bracket

1) Mark the four bracket holes on the busbar, calculated as follows: Y=T+69. (measurements in millimeters).

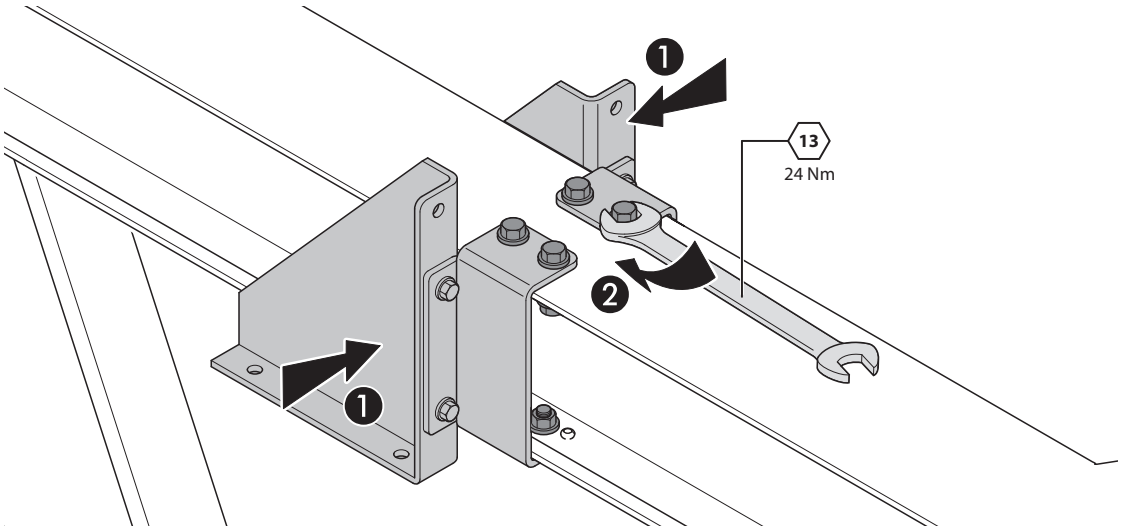




2) Drill the busbar at the marks just made: HOLE ø = 9mm.



3) Screw the brackets to the busbar with a torque of 24 Nm.



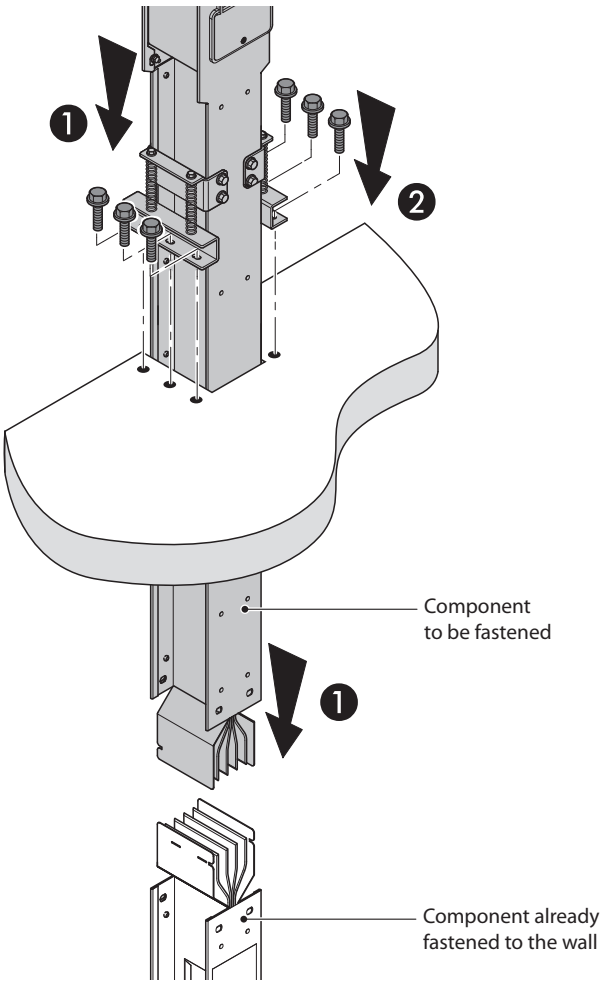
3. Installation

3.3.4 Busbar mounting in line

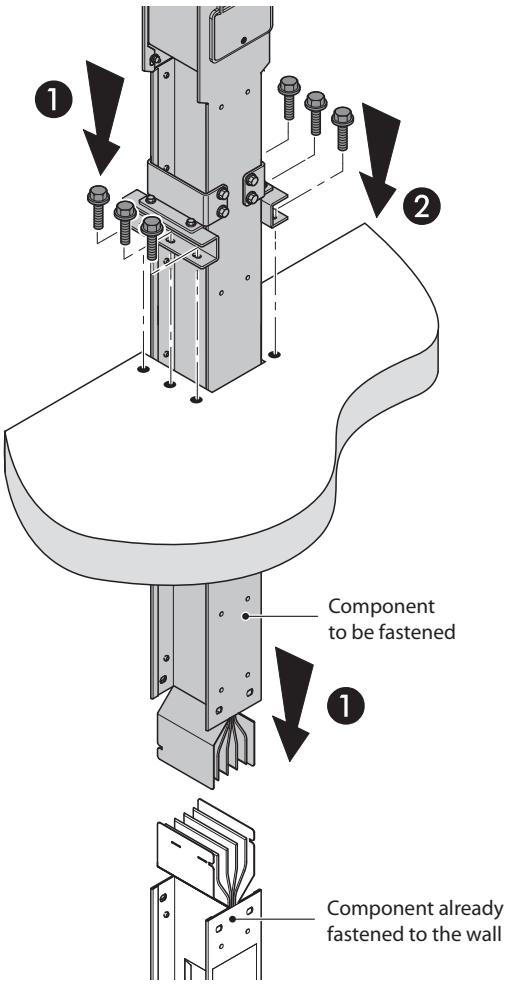
3.3.4.1 Floor bracket with/without springs

1) Join the two components following the instructions below.

Floor bracket with springs (type C)

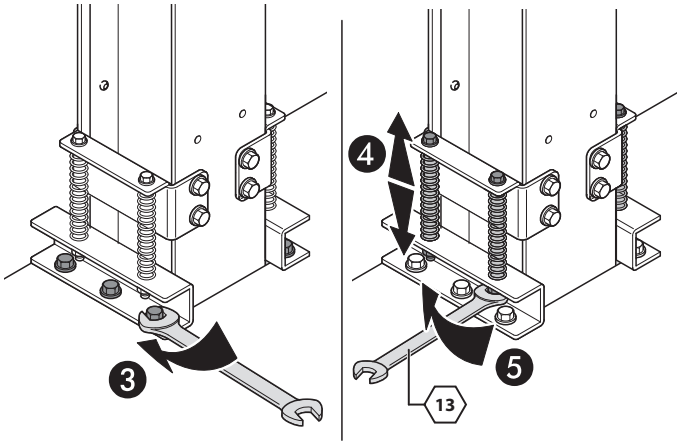


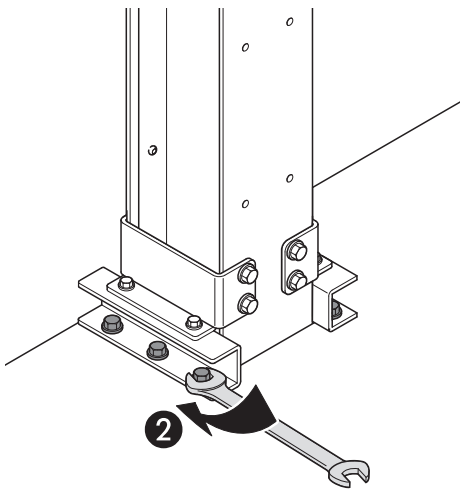
Floor bracket without springs (type D)



2) Match the bracket with the holes previously drilled on the floor and fasten with the screws.

3) For brackets with springs, unscrew the spring nuts.

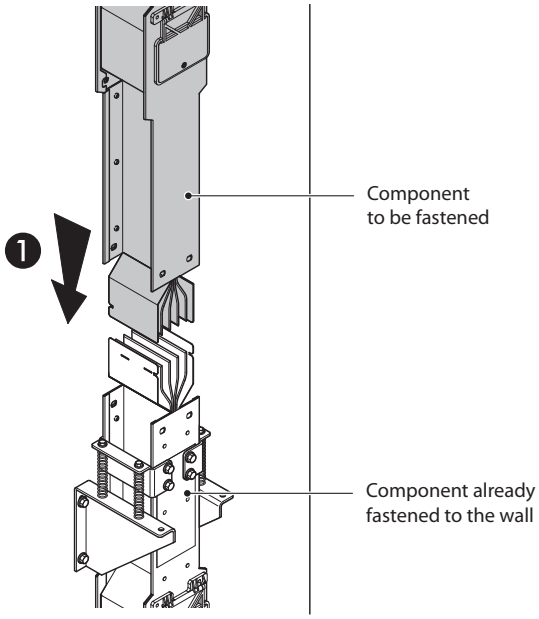




WARNING
The nut must be fully unscrewed, therefore releasing the springs.

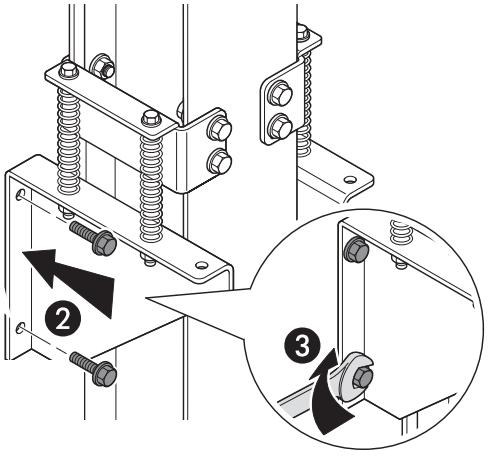
3.3.4.2 Wall bracket with springs and anti-seismic bracket

1) Join the two components following the instructions below.

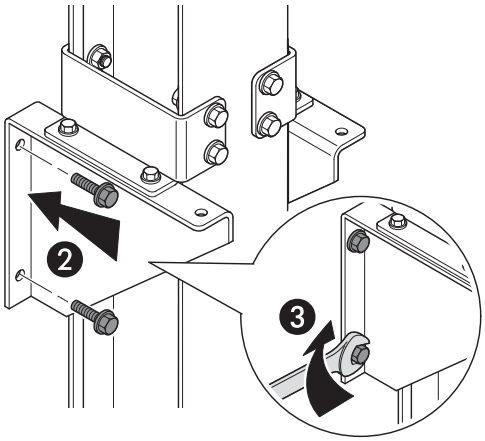


2) Match the the bracket with the holes previously drilled on the wall and fix with the screws.

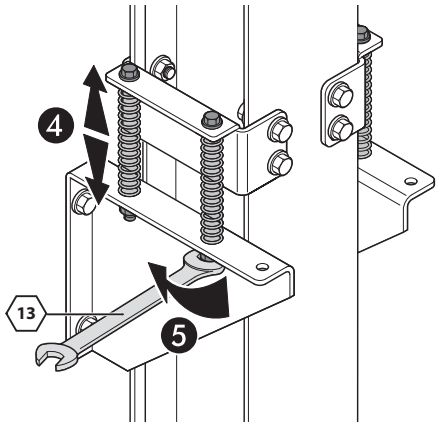
Wall bracket with springs (type A)



Anti-seismic bracket (type B)



3) For brackets with springs, unscrew the spring nuts.

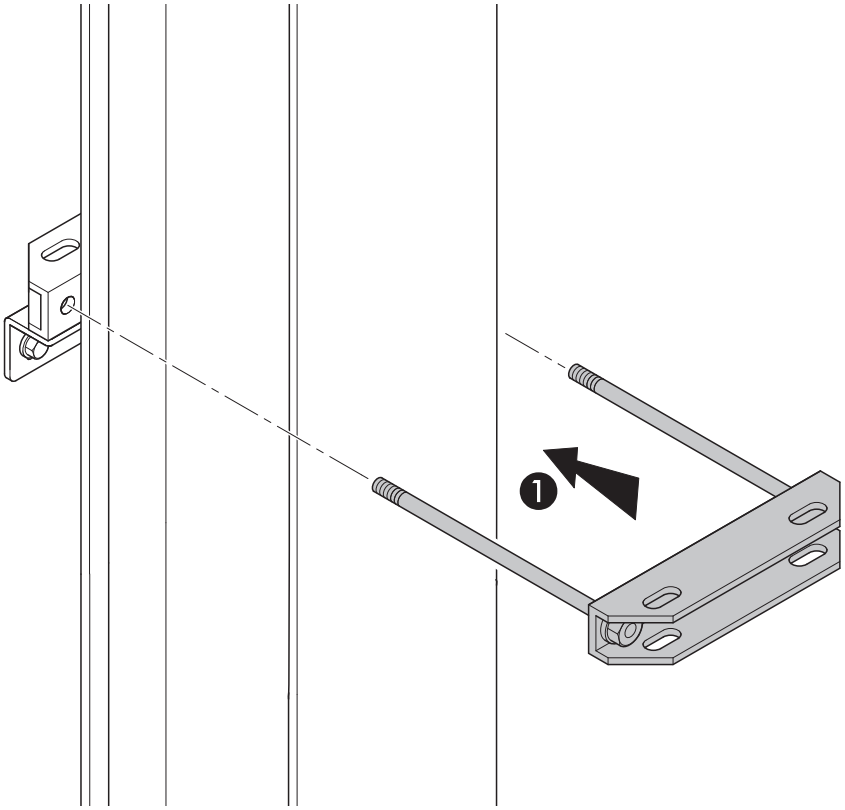


WARNING
The nut must be fully unscrewed, therefore releasing the springs.

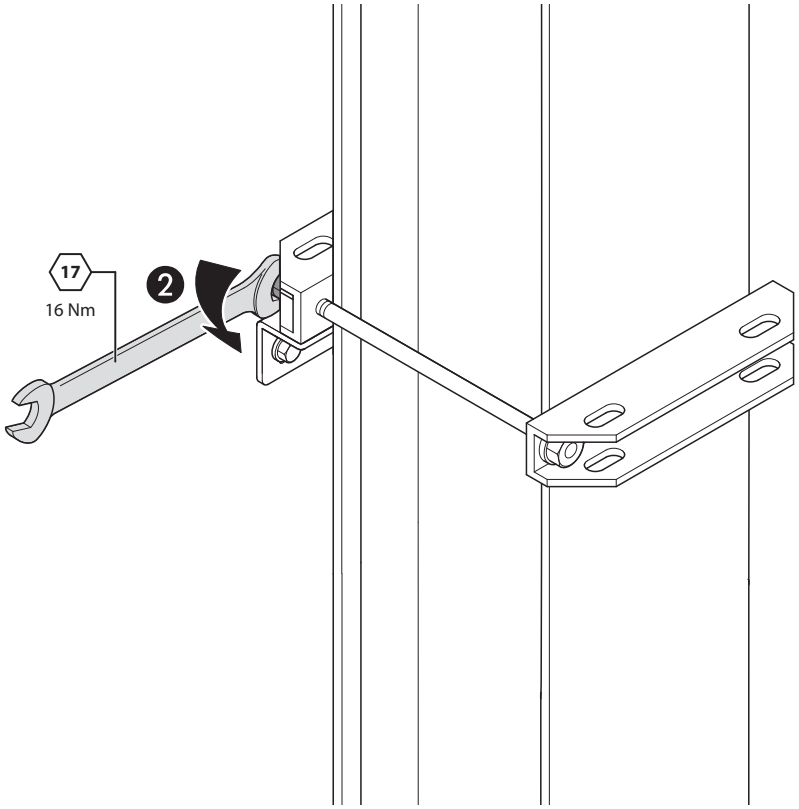
3. Installation

3.3.4.3 Standard bracket

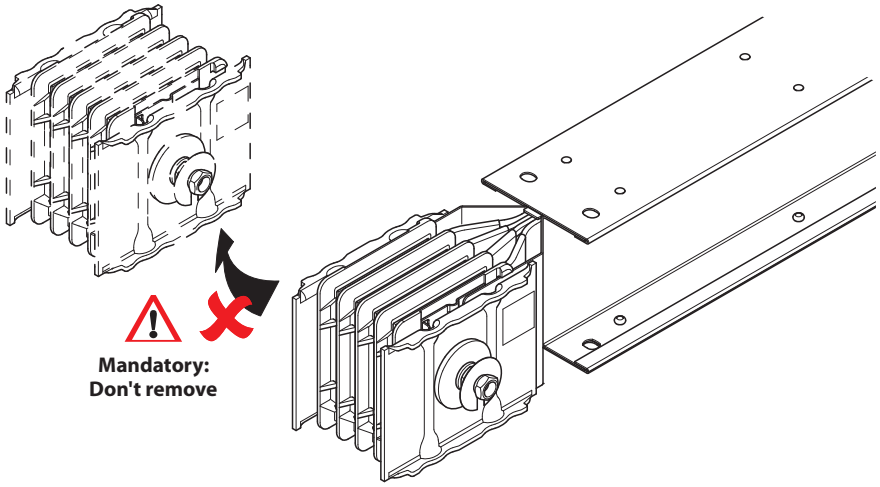
1) Using the screws supplied, attach the bracket to the one already attached to the support.

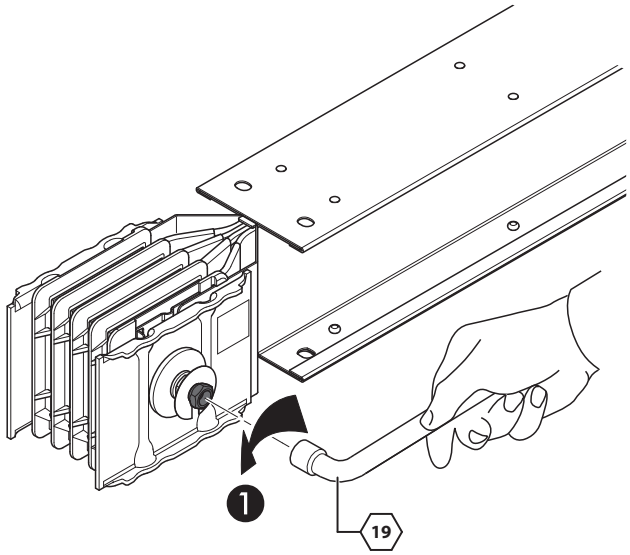


2) Tighten the screw with a torque of 16 Nm.

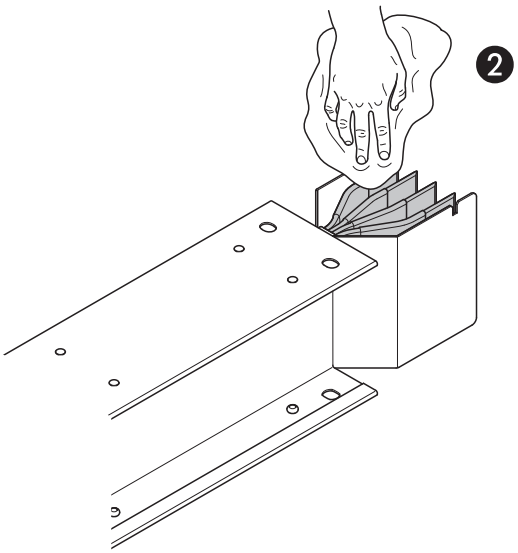


3.3.5 Joint installation



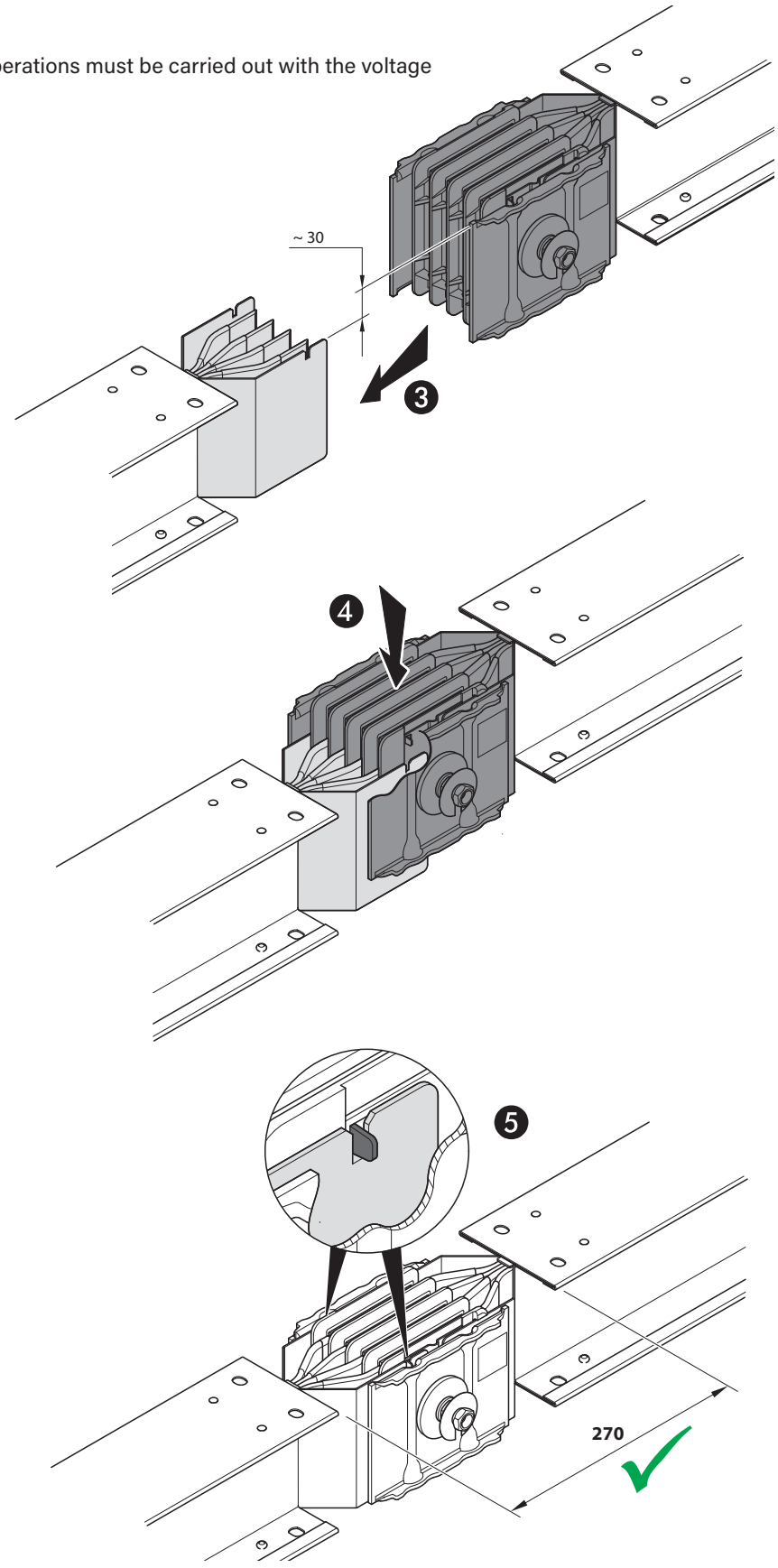


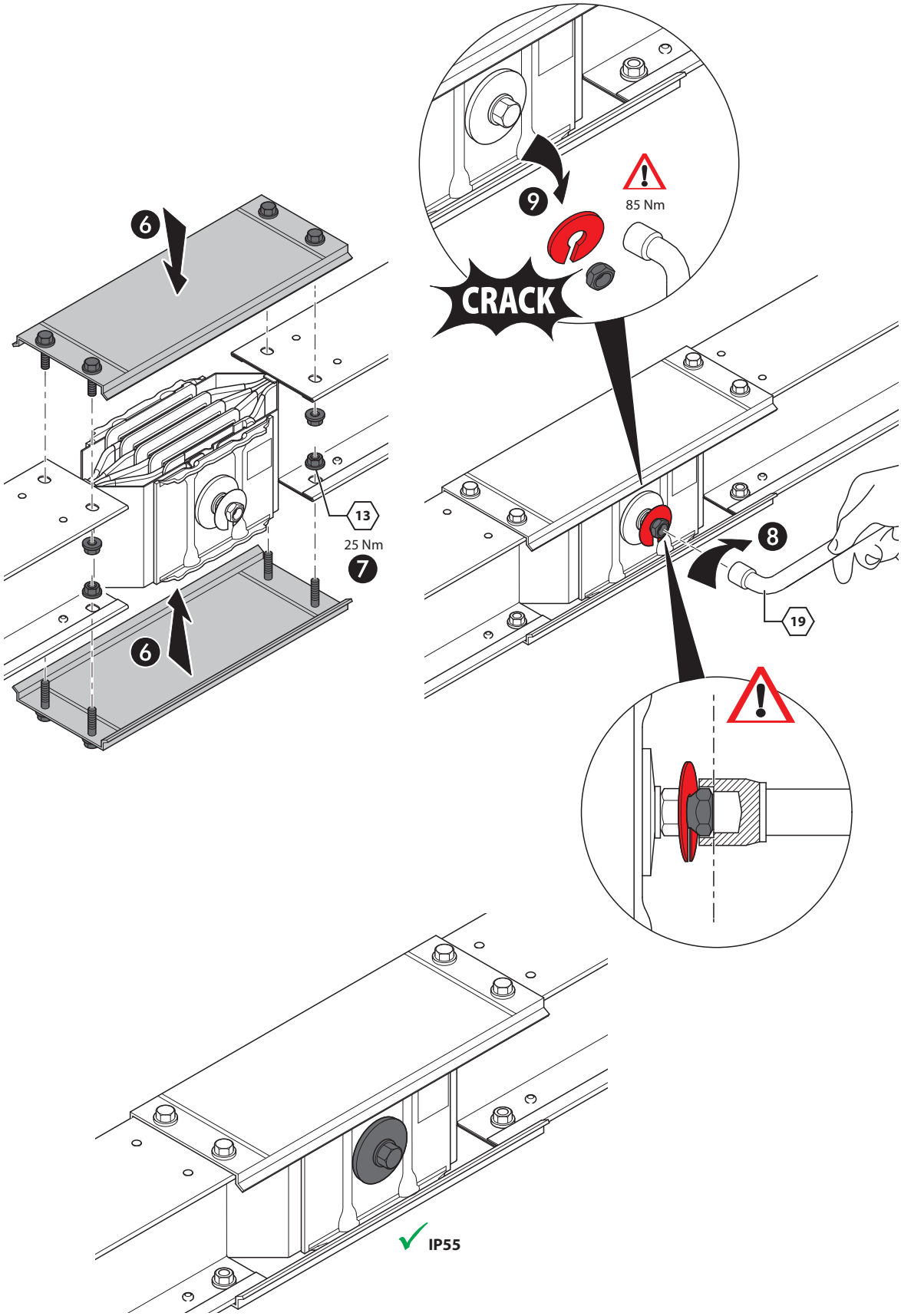
WARNING
Remove residues with mild reagents not corroding or creating abrasion on surface treatment (zinc, tin, silver coating) or on contact surface (copper).



3. Installation

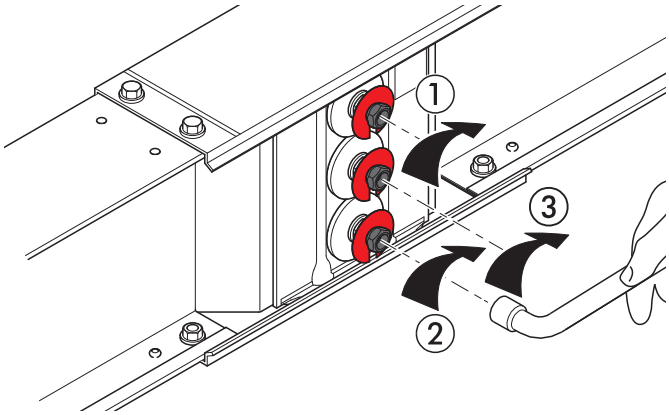
DANGER
The following operations must be carried out with the voltage disconnected.

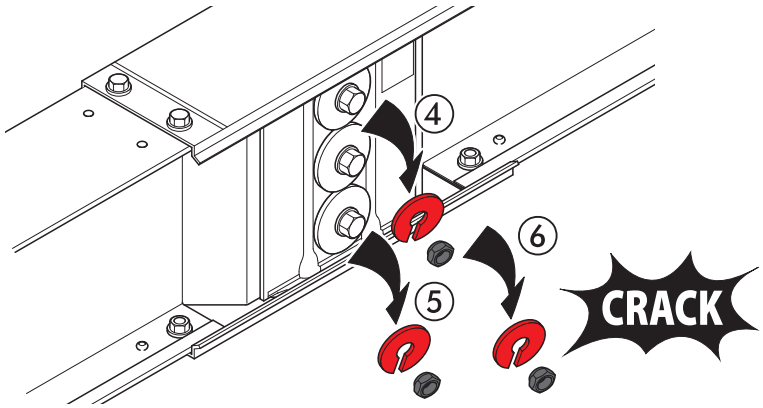


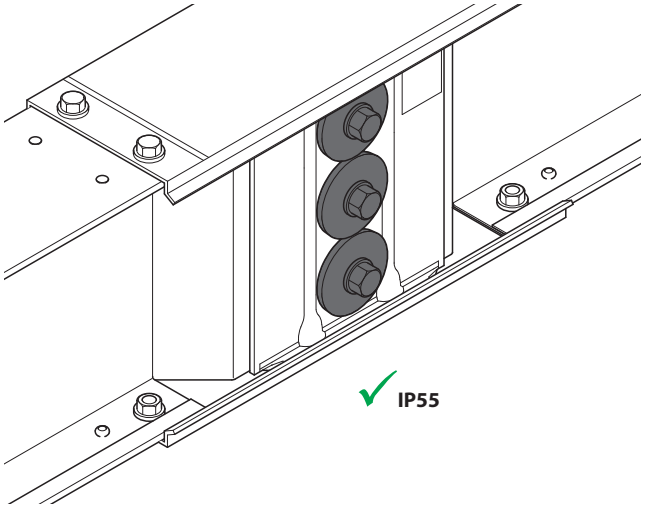

6
13
25 Nm
7
6
9
85 Nm
CRACK
8
19
IP55

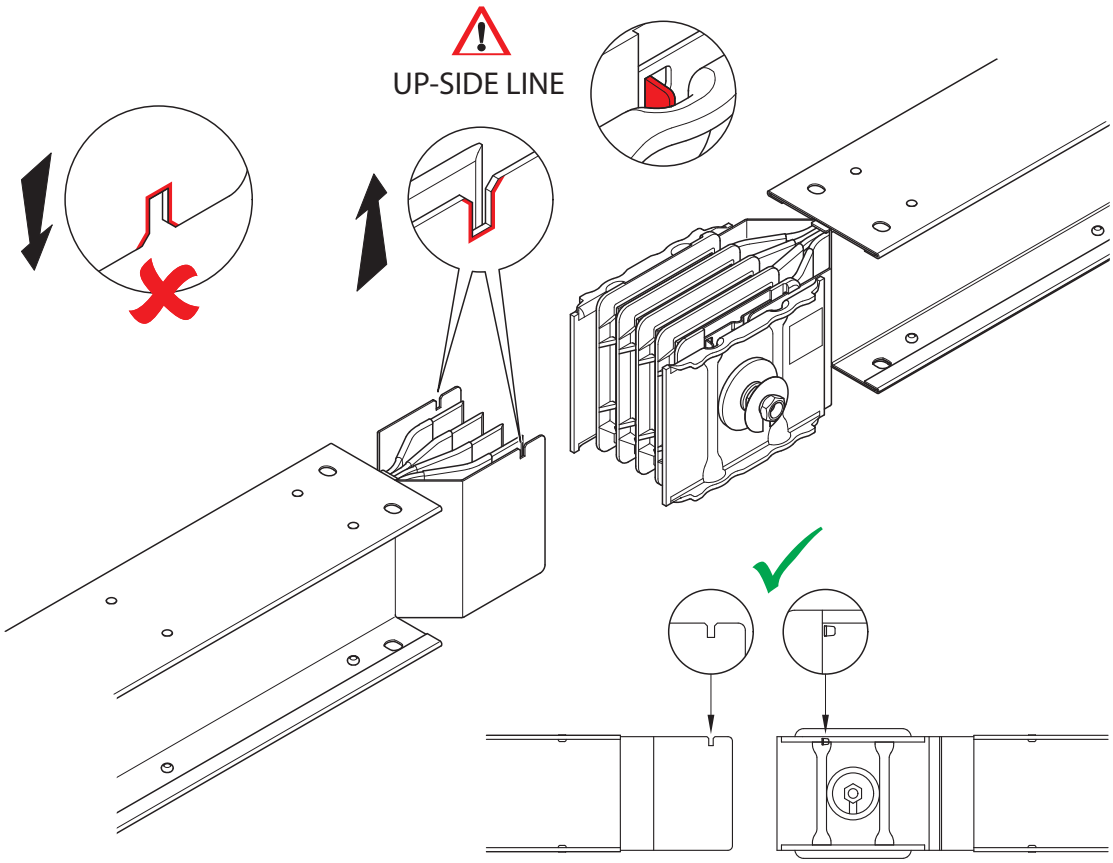
3. Installation

In case of multi-bolt busbars, follow the sequence below









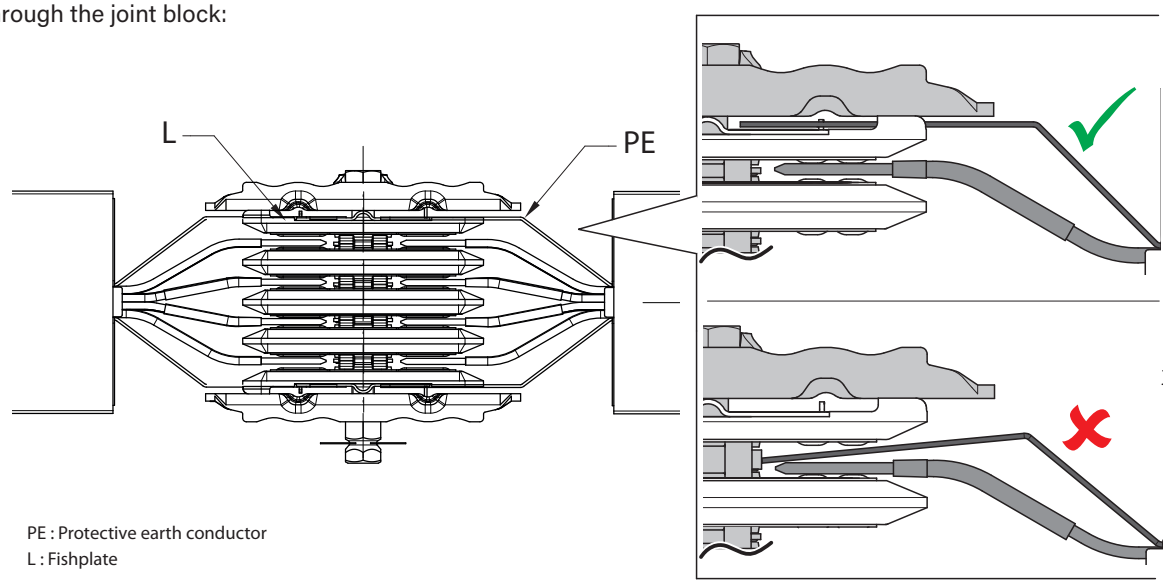
DANGER

Hazard of short circuit

- It is mandatory to correctly align all path components, joint blocks and PE conductors .
- It is mandatory to correctly position, between the fishplates, all path components conductors and the metallic side of the PE conductor between the fishplates.

Failure to follow these instructions will result in death or serious injury.

The continuity of the PE conductors is established by the enclosure of the path component. You must check the correct position of the components, joint blocks, and PE conductors and the continuity of the PE conductors through the joint block:



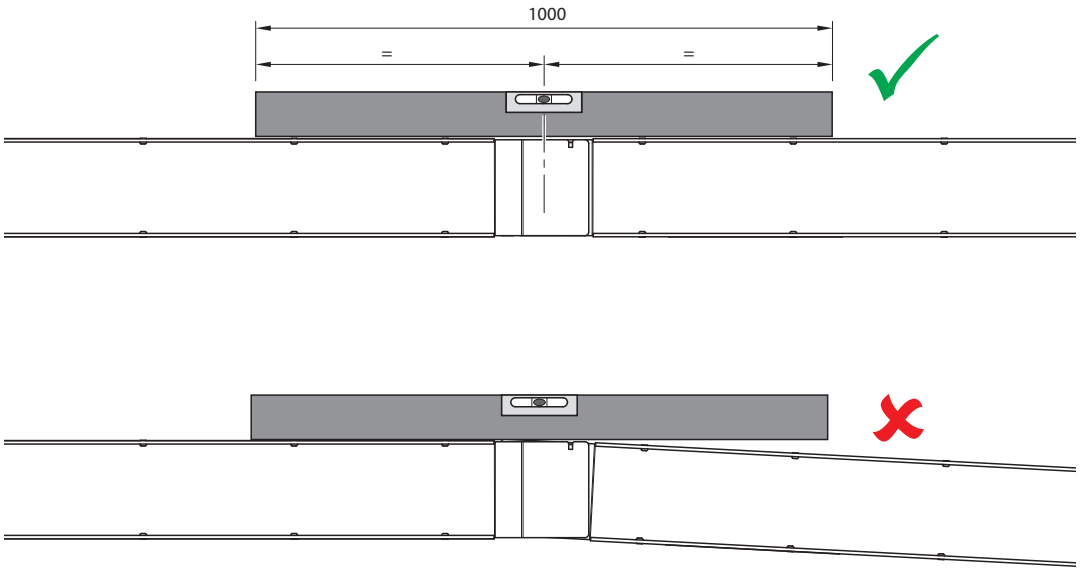
PE : Protective earth conductor
L : Fishplate

3. Installation

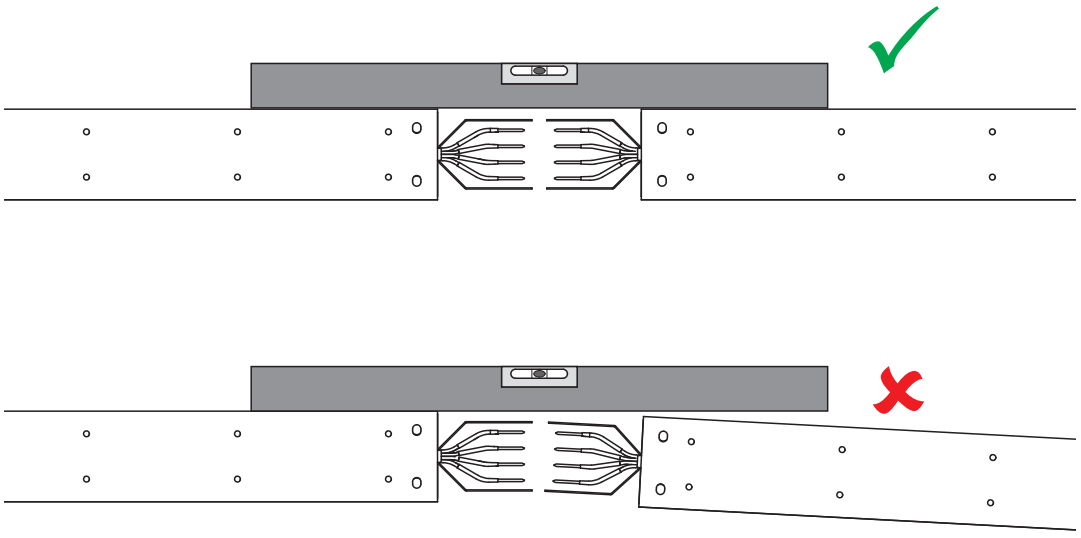
DANGER
LOSS OF IP55 PROTECTION RATING
The path components must be correctly aligned.
Failure to follow these instructions can result in equipment damage.

The alignment must be checked on both sides of the path components:

Check the alignment on the loop of the path components:



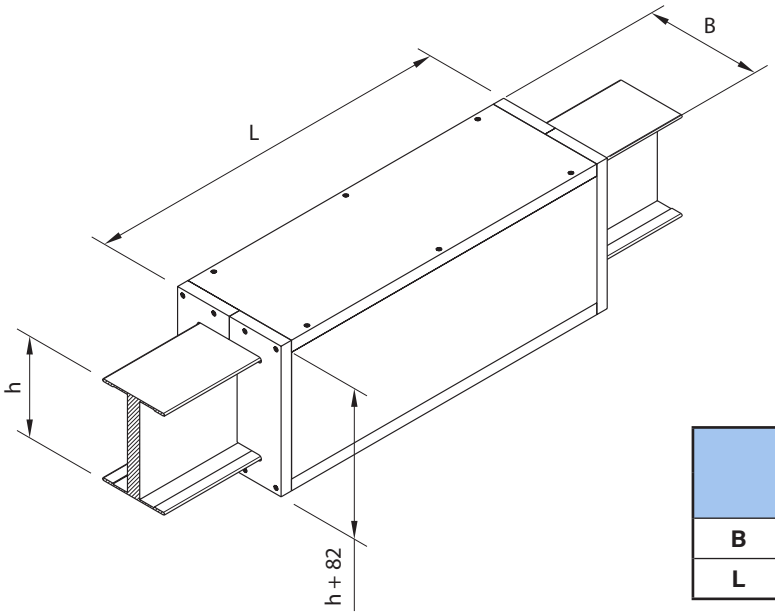
Check alignment on the side of the path components

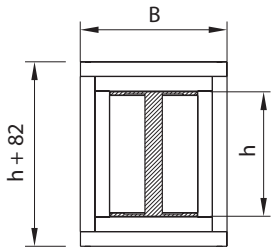


3.3.6 Fire barrier installation

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

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





	XCP-S		XCP-HP	
	Al	Cu	Al	Cu
B	200		205	
L	630	1000	630	1000

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

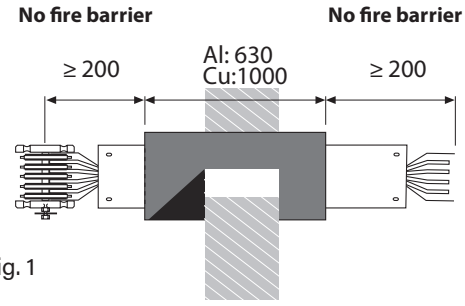


Fig. 1

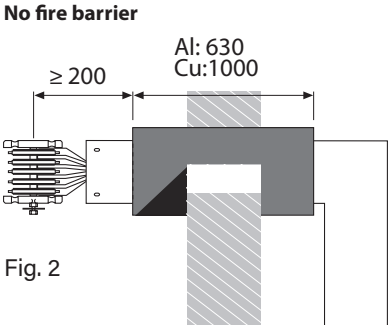


Fig. 2

	USE OF INTERNAL OR EXTERNAL BARRIER					
	Al			Cu		
	Rating (A)	Internal	External	In (A)	Internal	External
XCP-S	630-800	√	√	800-1000	√	√
	1000-2000	–	√	1250-2000	–	√
	2500-4000	–	√	2500-5000	–	√
	5000	√	√	6300	√	√
XCP-HP	630-2000	–	√	800	√	√
	2500-4000	–	√	1000-2500	–	√
	5000	√	√	3200-5000	–	√
	–	–	–	6300	√	√

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

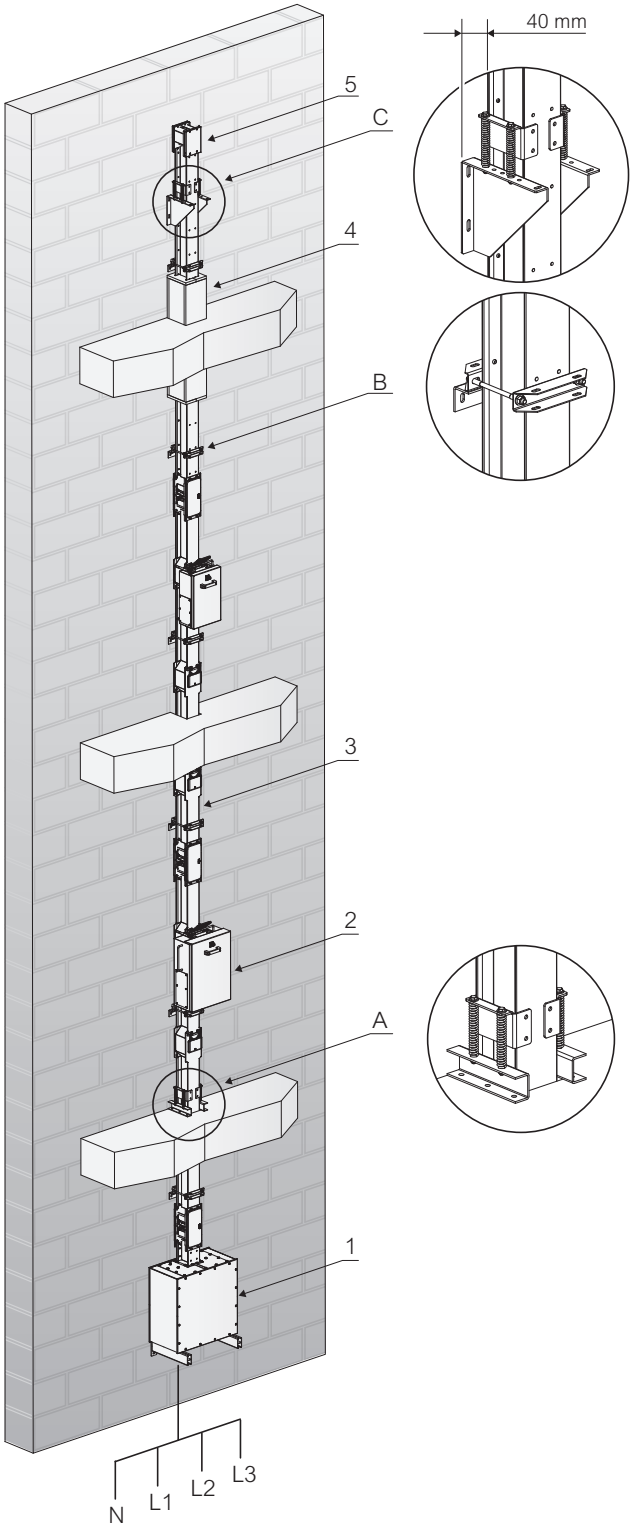
3. Installation

3.4 Product installation

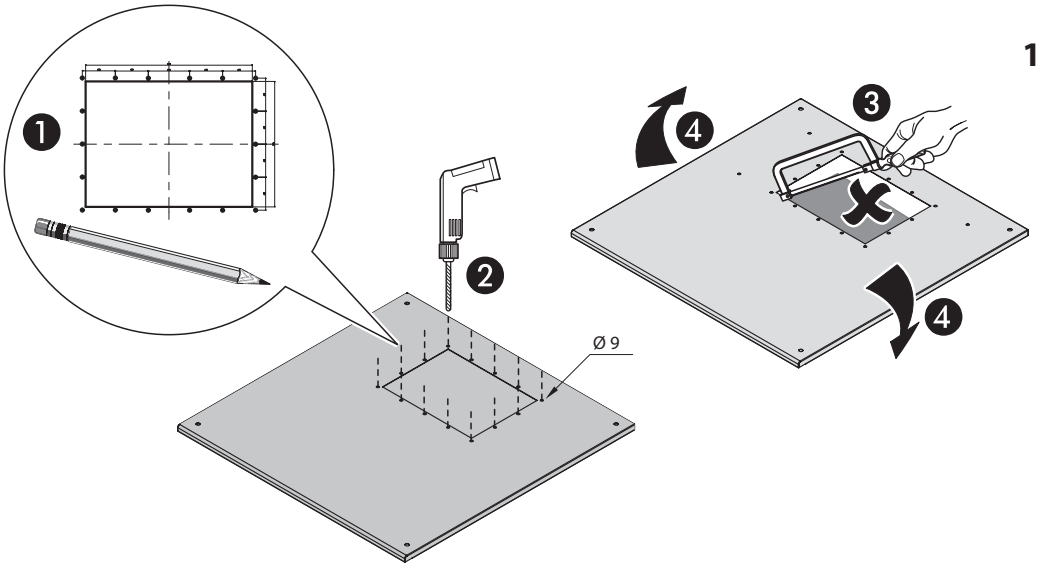
3.4.1 Operating instructions on how to design riser mains

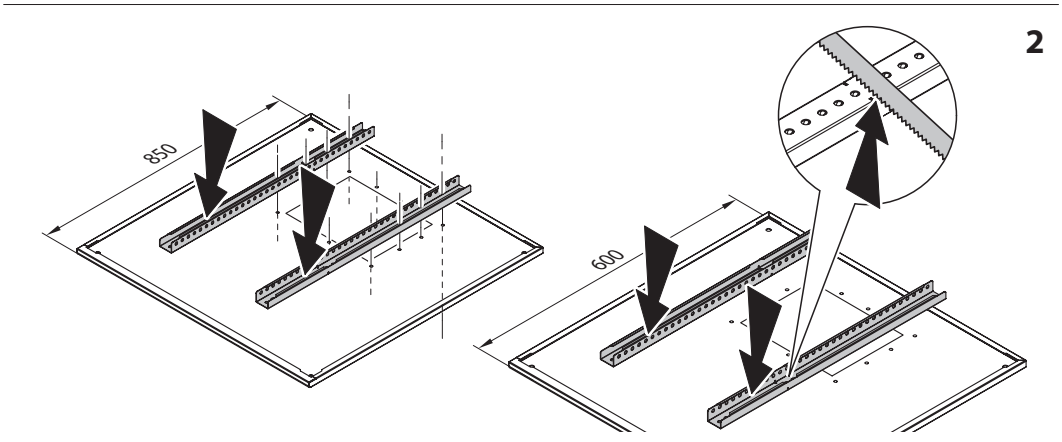
1) Use an RH end feed unit (without monobloc).The RH misaligned feed units (without monobloc) are used at the departure of the riser mains lines, allow the busbar to be installed 40 mm away from the wall. In order to position the tap-off boxes correctly as shown in the figure, the neutral conductor of the riser main must be on the left side of the element
2) The tap-off boxes can be installed in the tap-off outlets (Plug-in type) and on the junction of elements (Bolt-on type)
3) Use elements with tap-off outlets where necessary, distribute the power using plug-in boxes
4) Use EI120 fire barrier kit for each compartment floor, where specifically requested
5) At the end of the riser mains, position the IP55 end cover

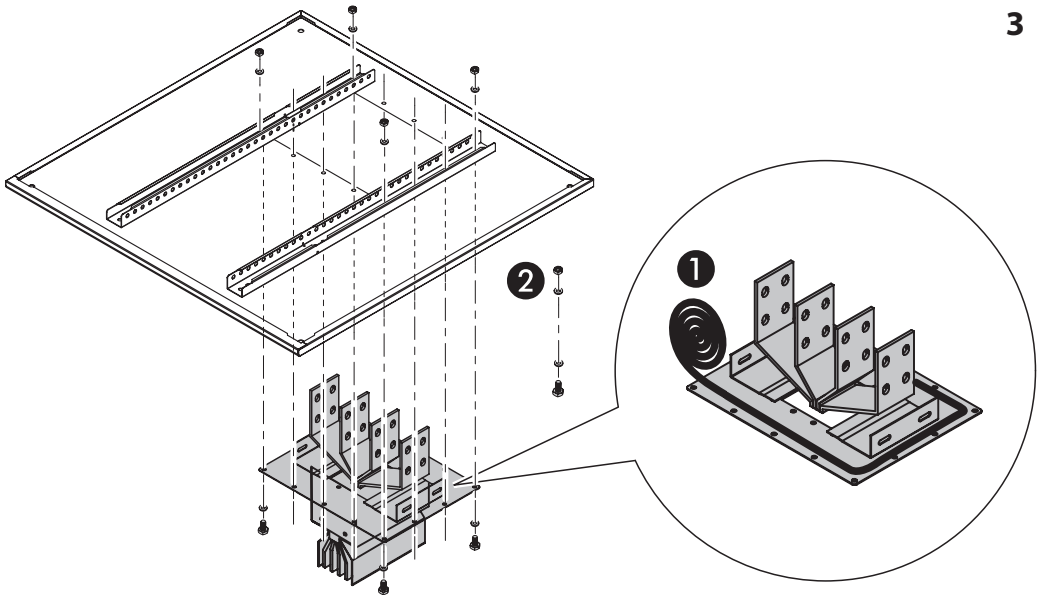
A) At the lowest point, use a fixed bracket (without spring) to avoid pressure on the cable connection box or low voltage switch board
B) Use a standard suspension bracket to hang the busbar every 2 metres of riser mains
C) Use one or more suspension brackets for the vertical elements, according to the weight of the whole riser mains



3.4.2 Panel end cap installation

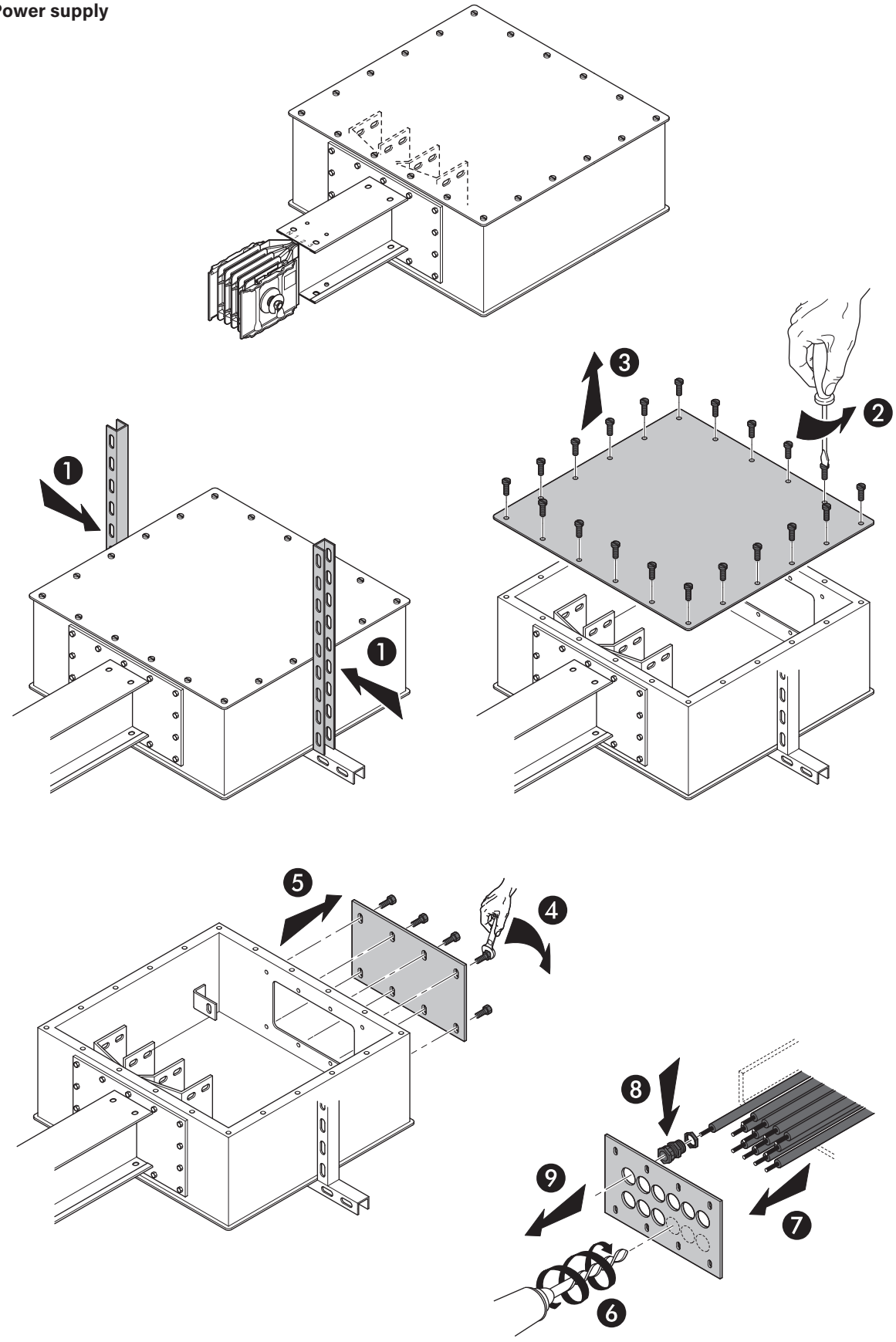


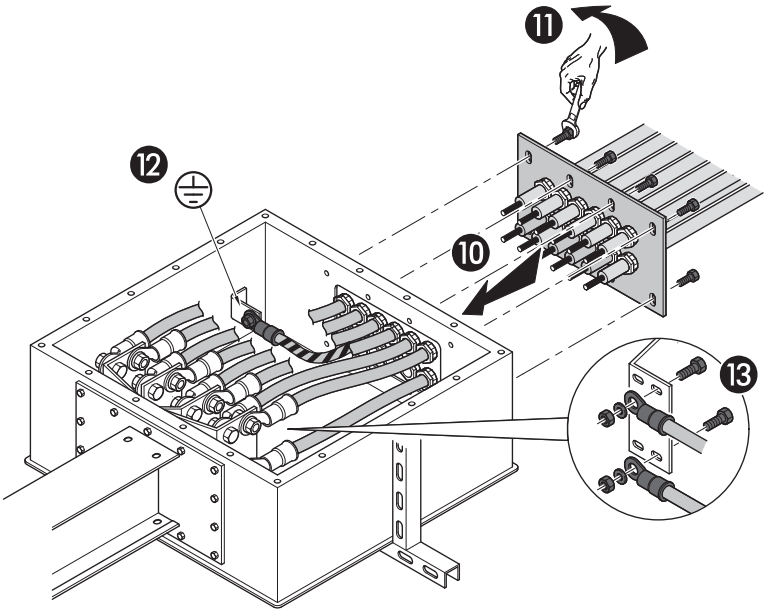




3. Installation

Power supply

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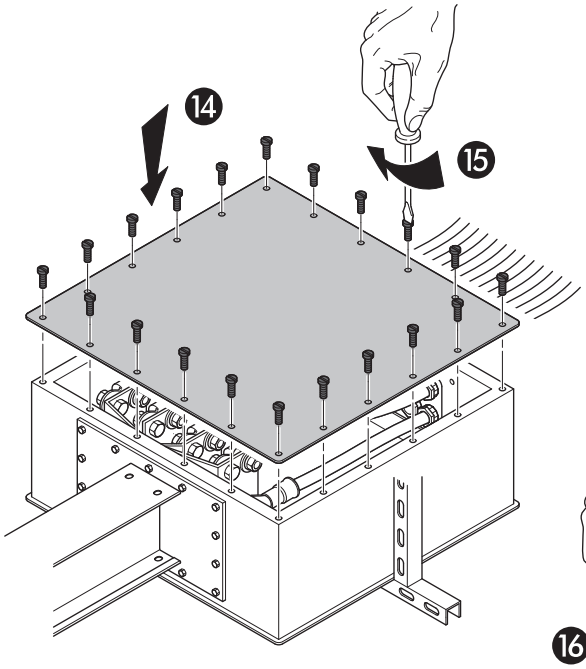
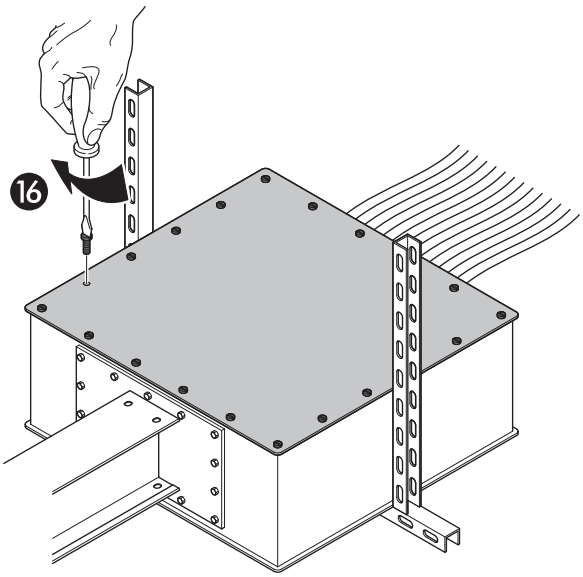
12
10
13

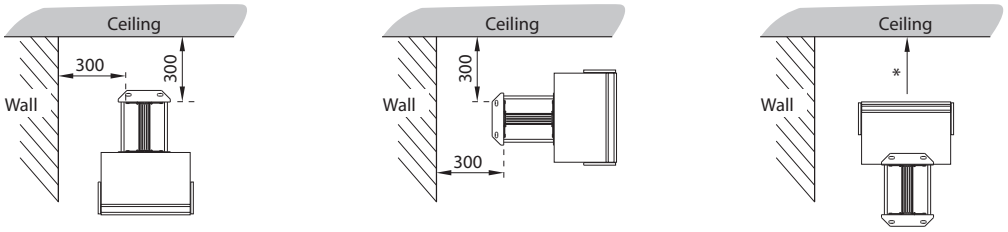

14
15


16

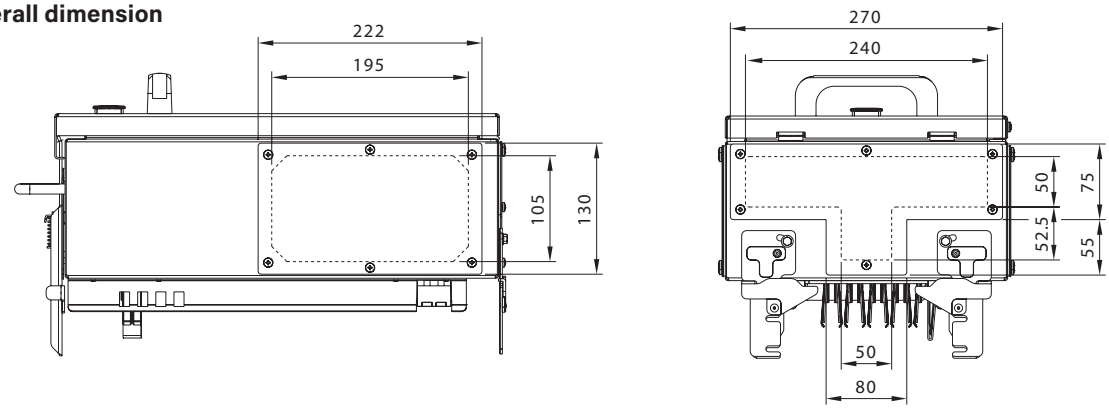
3. Installation

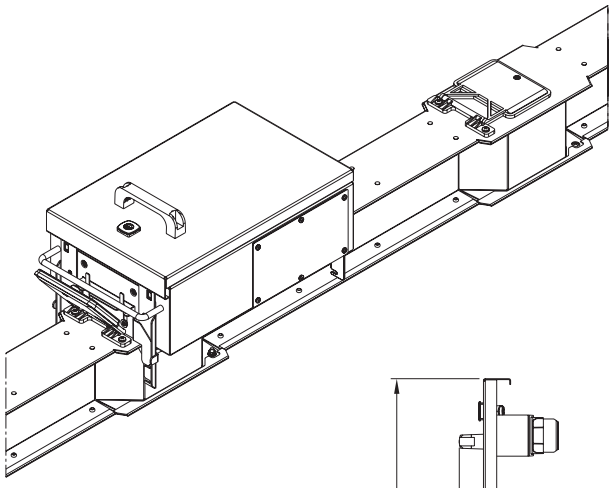
** When there is a tap-off box installed above the busbar, check the overall dimension of the open cover of the tap-off unit used in the specific section.*

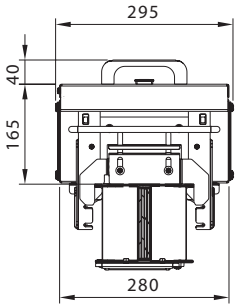
When there are tap-off units along the busbars, the minimum distances depend on the dimensions of the tap-offs selected.

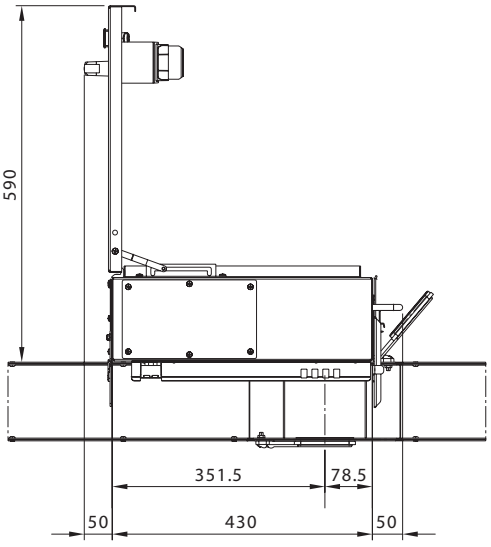


Metal T1
overall dimension

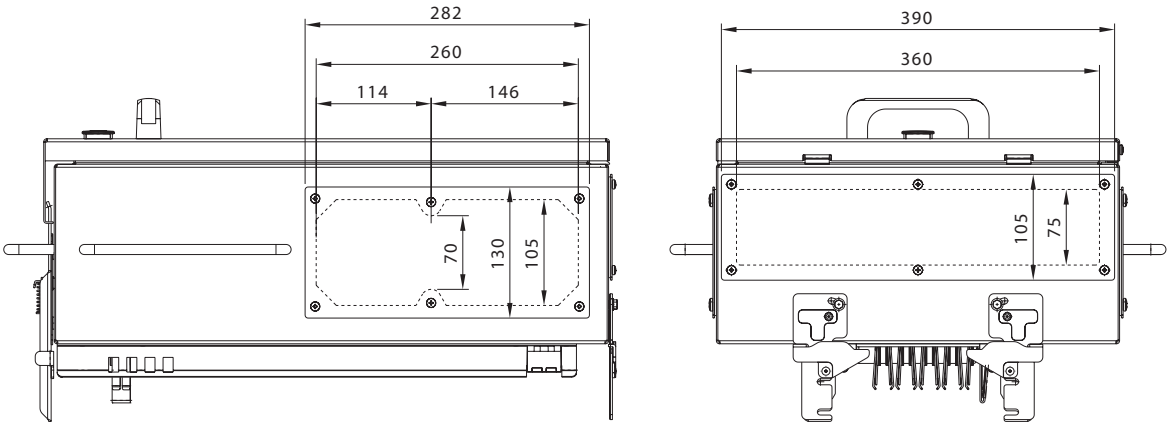


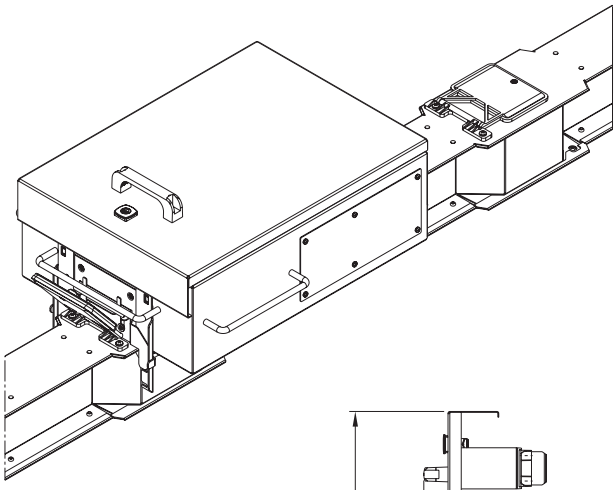


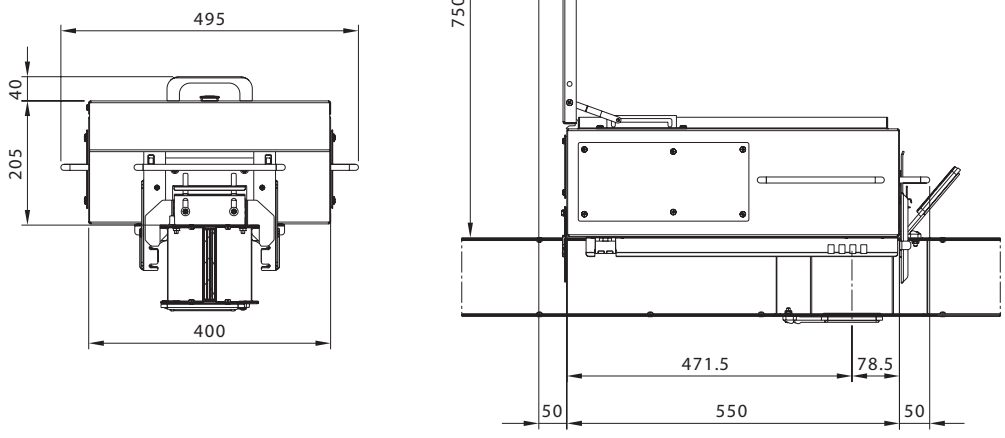




Metal T1
overall dimension

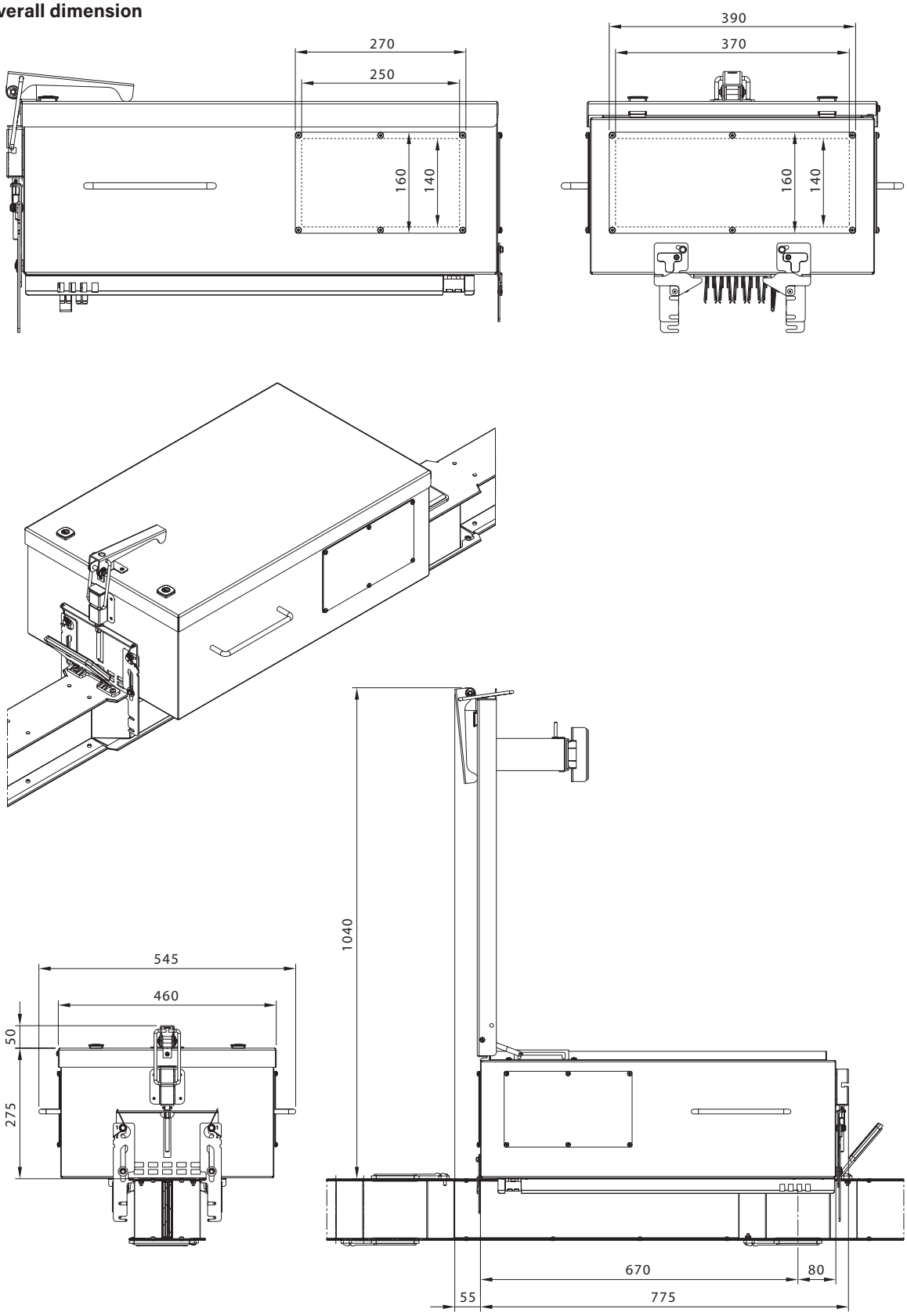




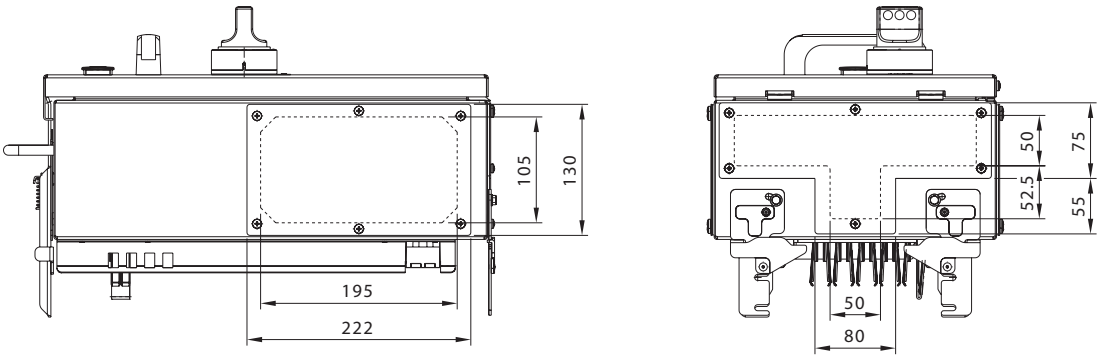


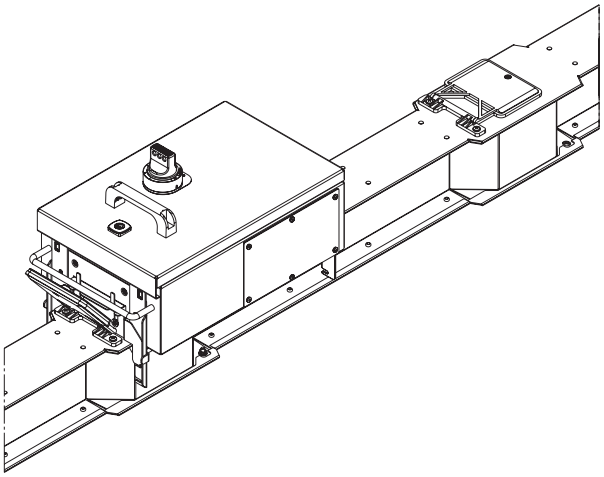
3. Installation

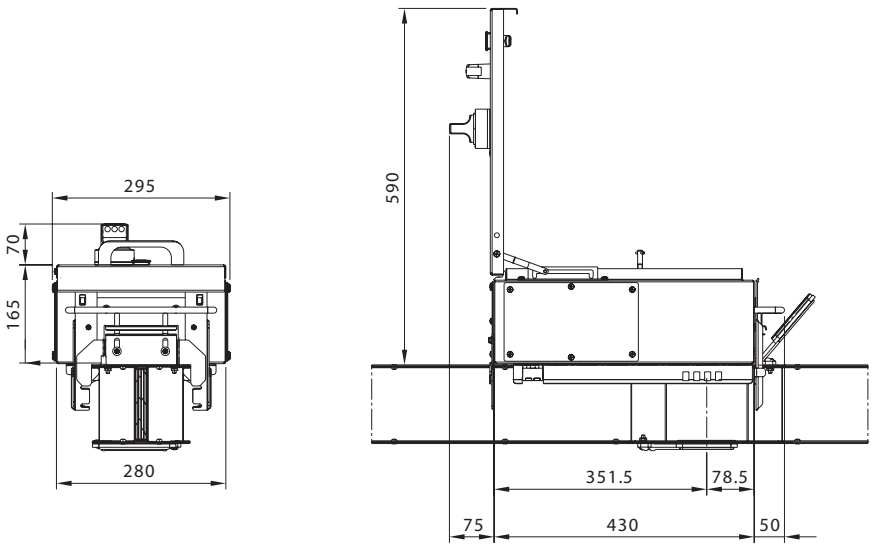
Metal T1
overall dimension



Metal T2
overall dimension

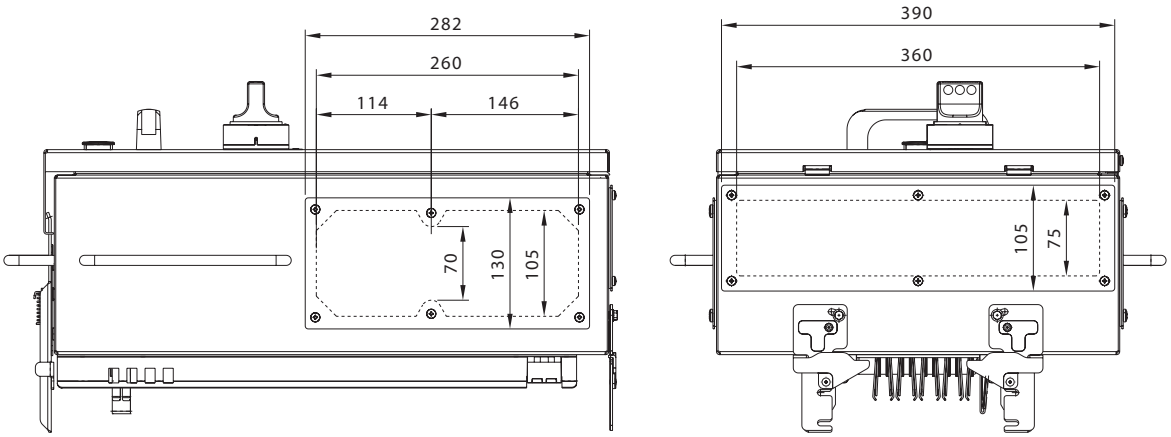


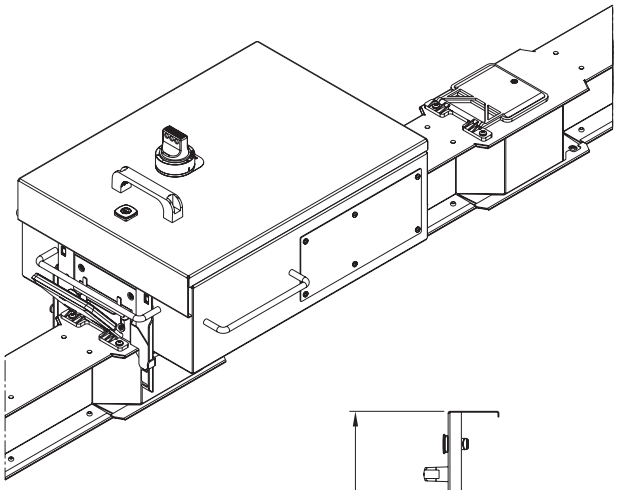


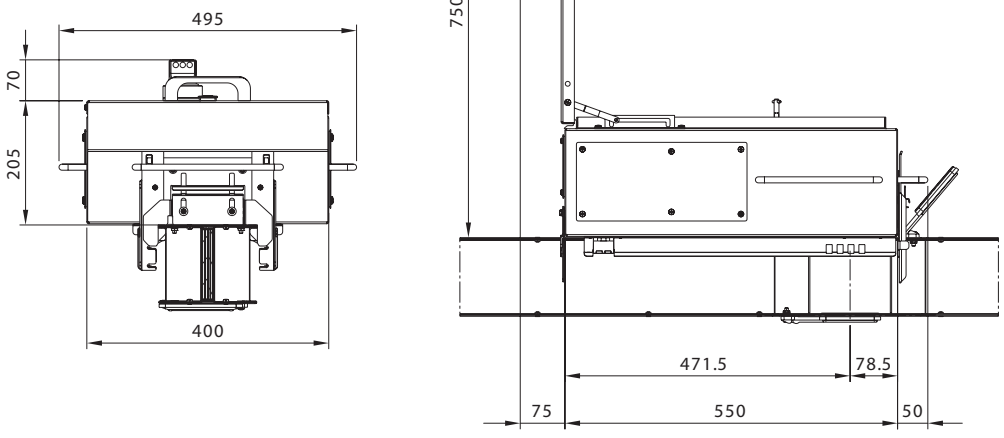


3. Installation

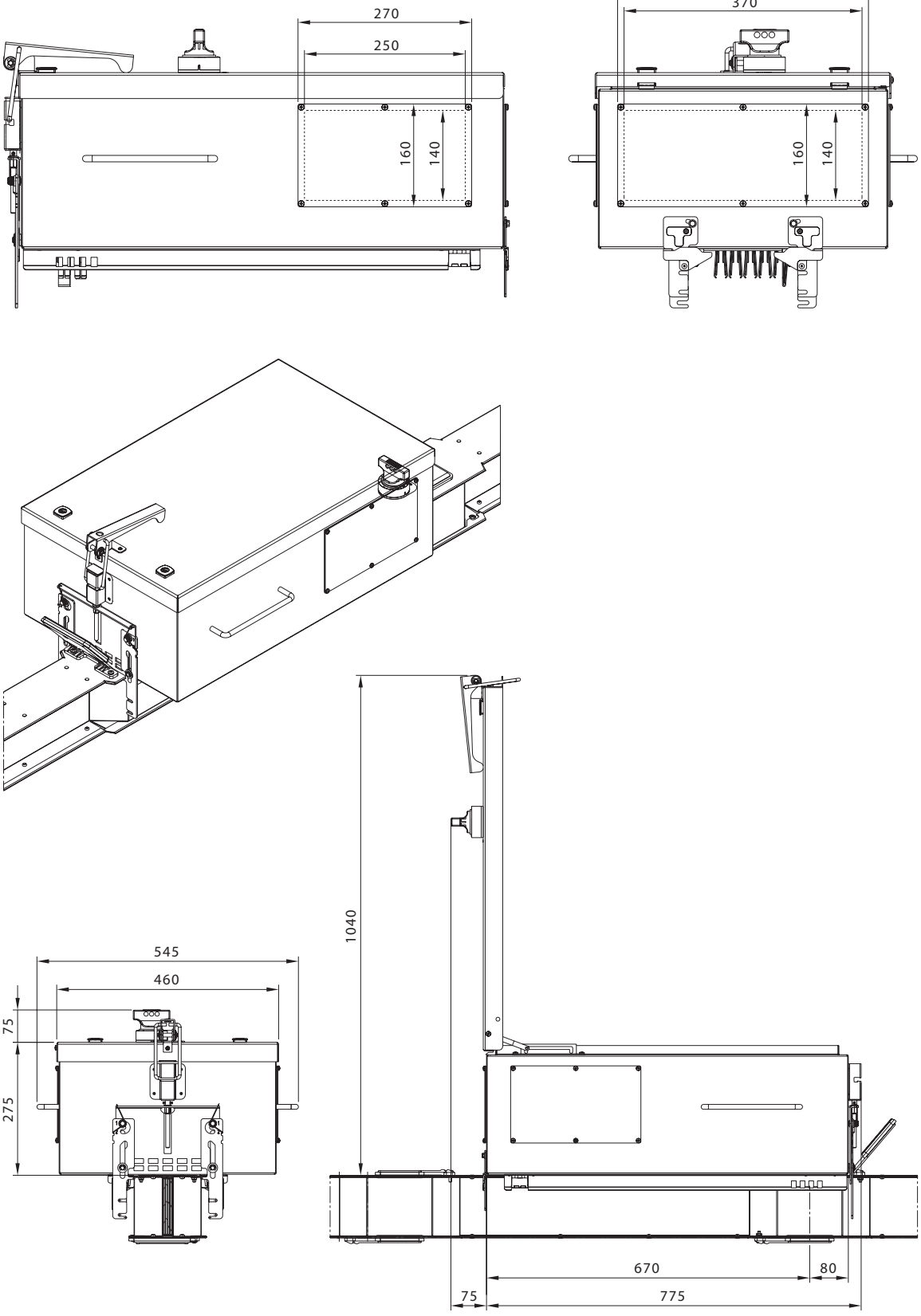
Metal T2
overall dimension





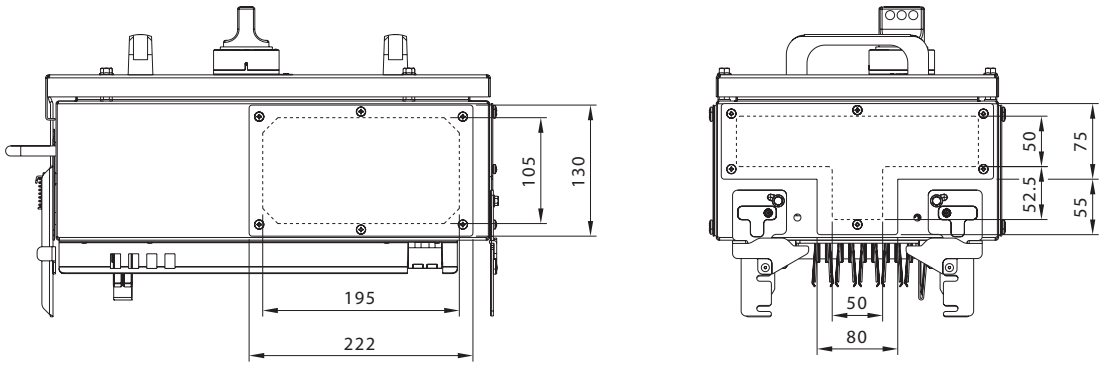


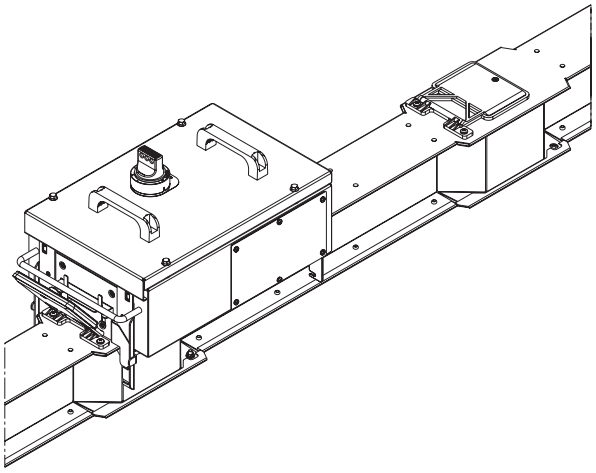
Metal T2
overall dimension

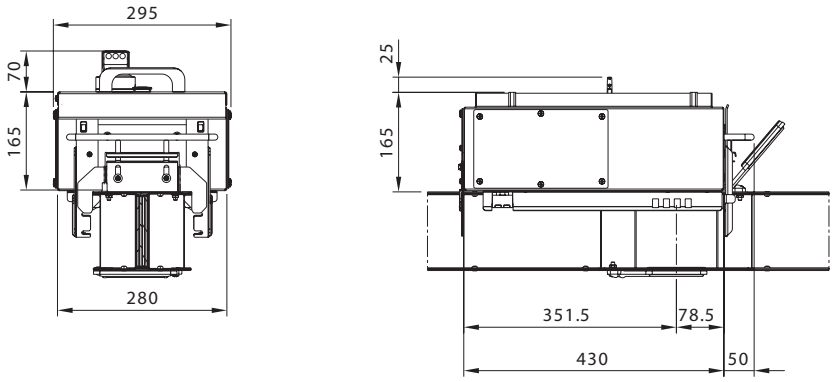


3. Installation

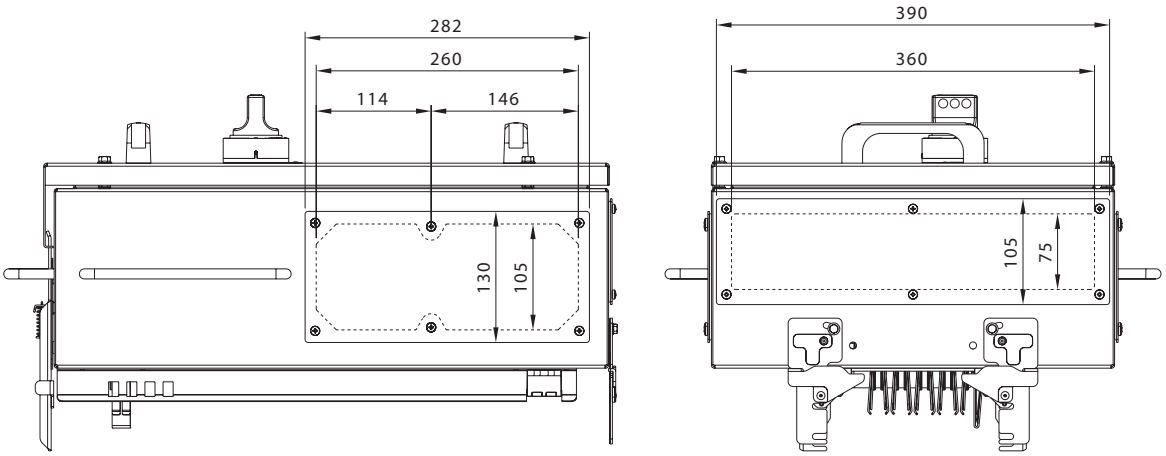
Metal T3
overall dimension

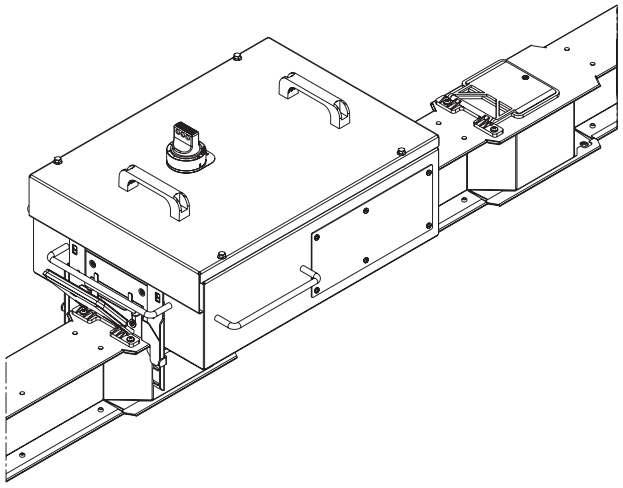


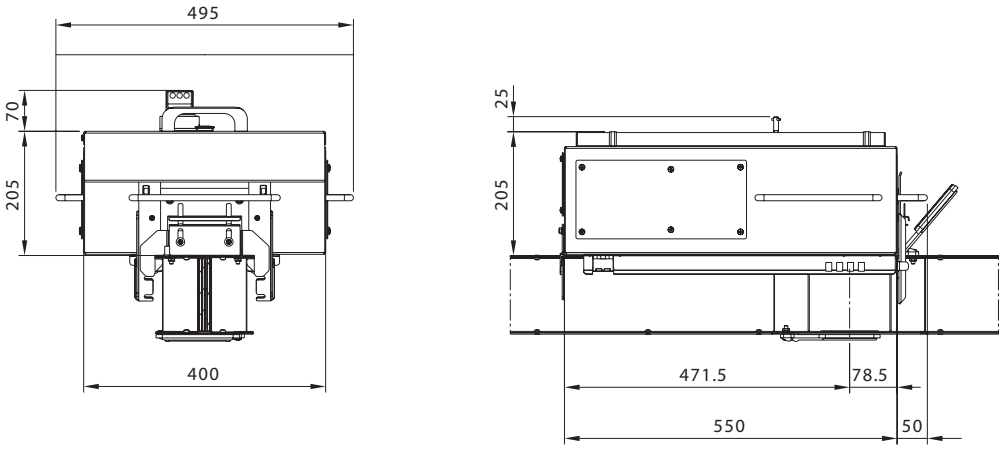




Metal T3
overall dimension

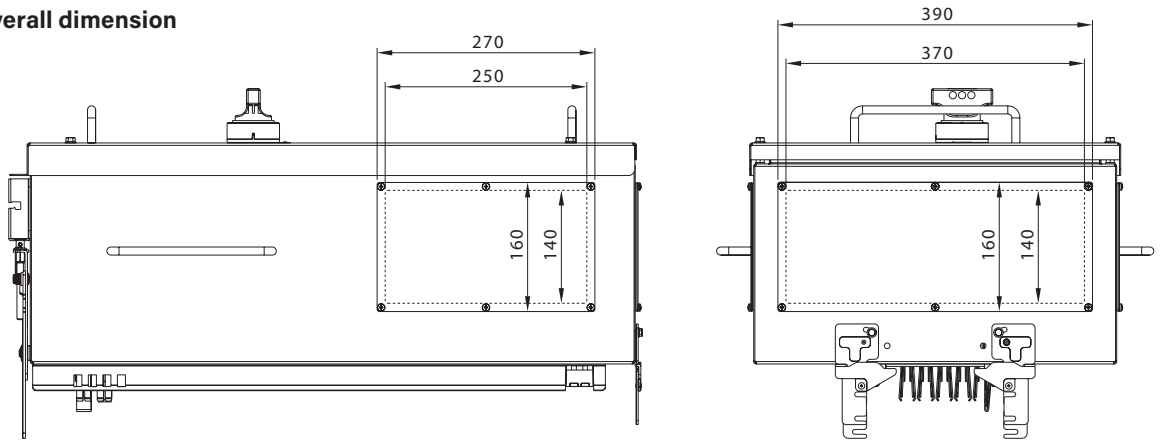


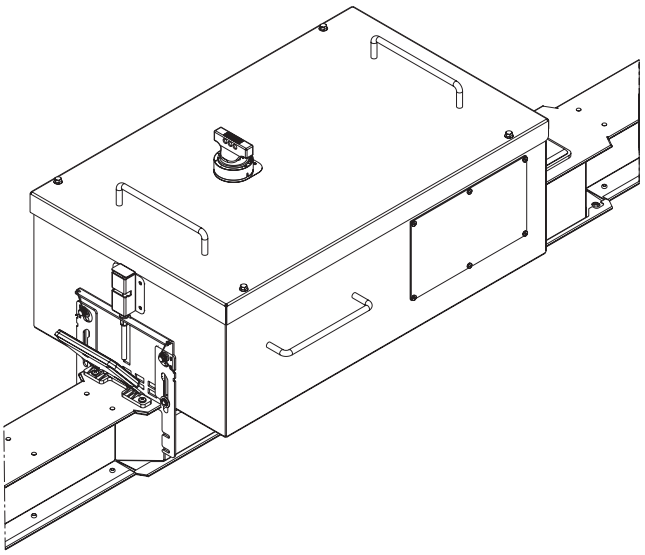


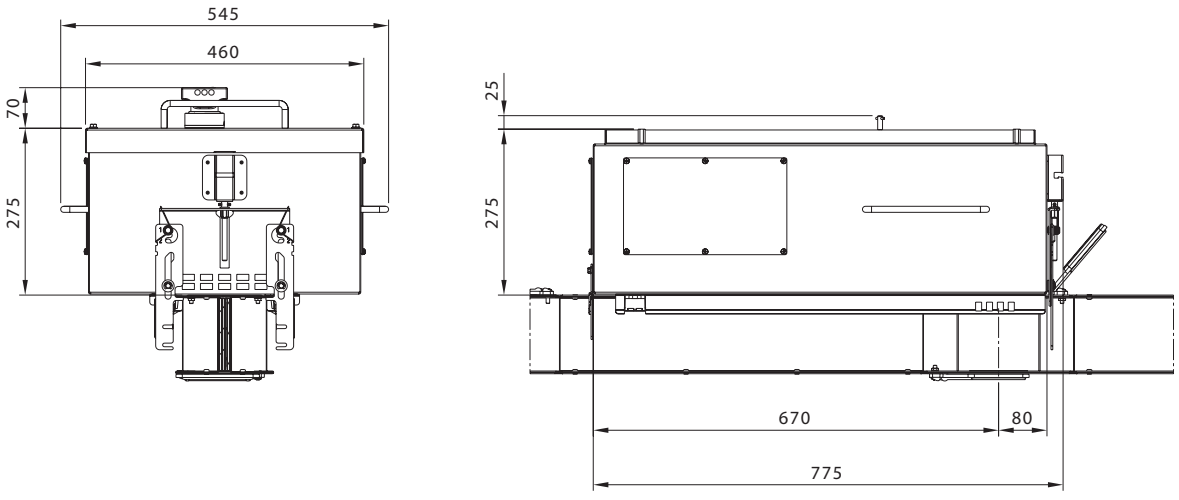


3. Installation

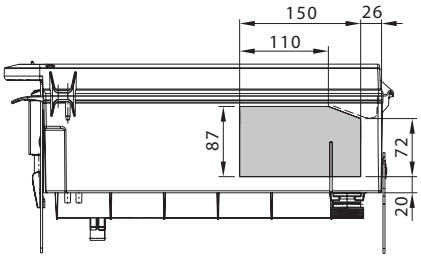
Metal T3
overall dimension



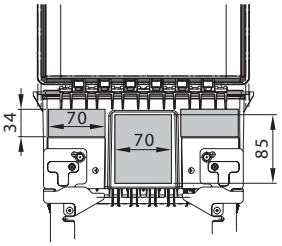




Fiberglass plastic T2
overall dimension



FAIRLEADS
ISO 16:14
ISO 21:10
ISO 25:6
ISO 40:3
ISO 50:2



FAIRLEADS
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ISO 21:9
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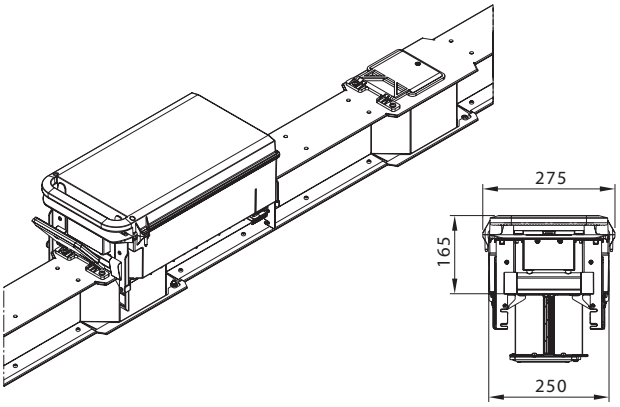
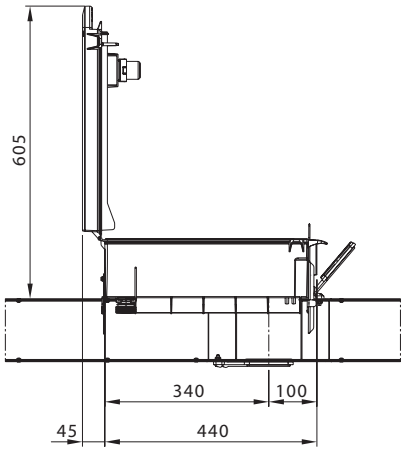
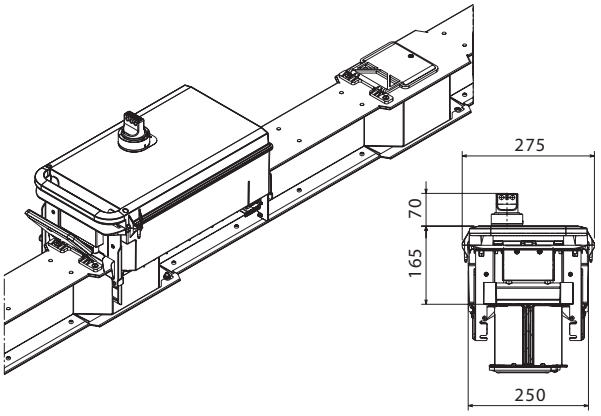
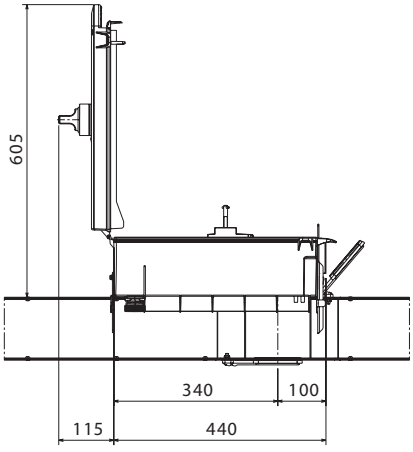
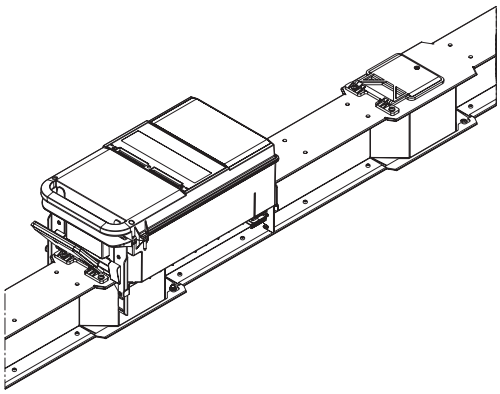
ISO 50:1

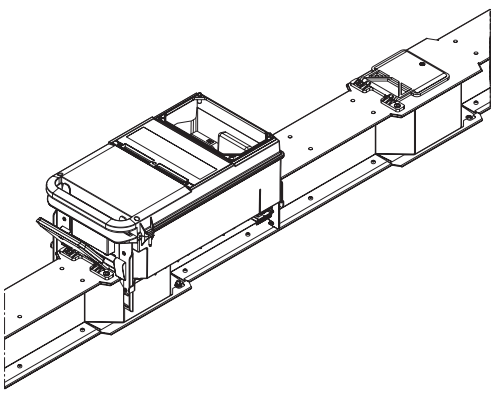






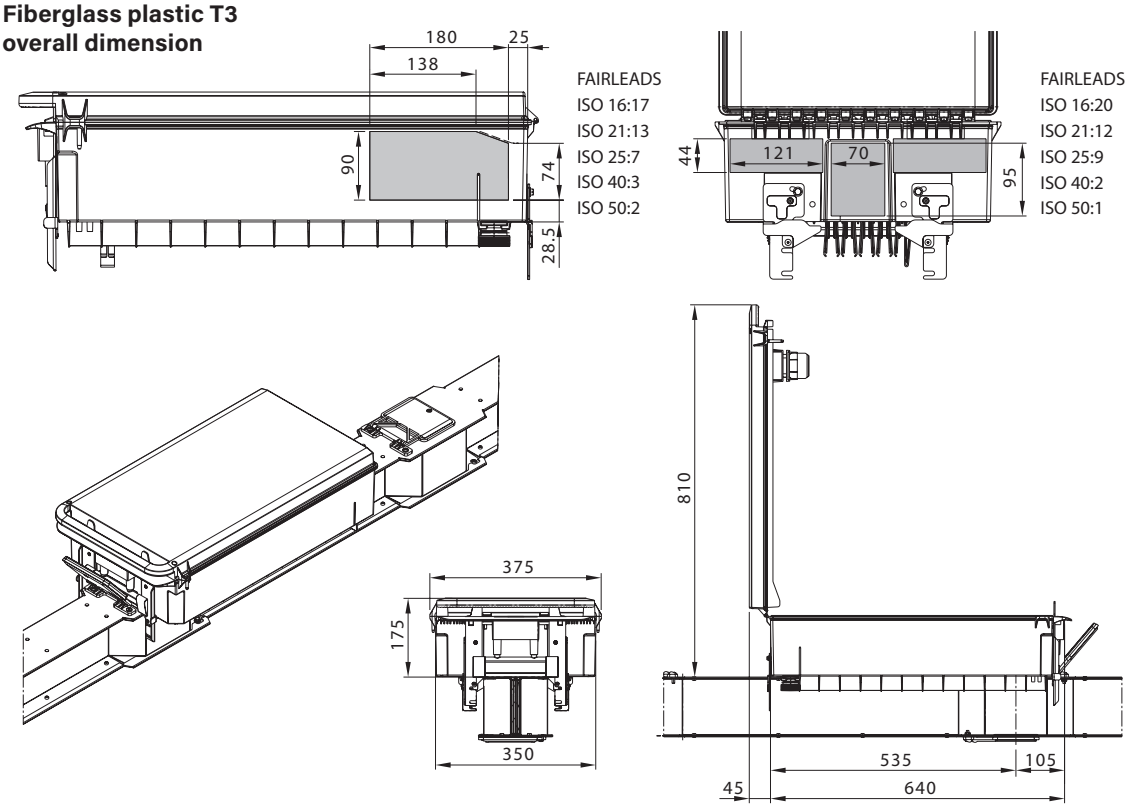




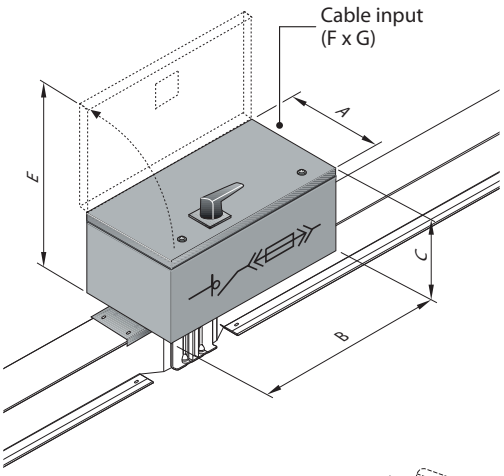


3. Installation

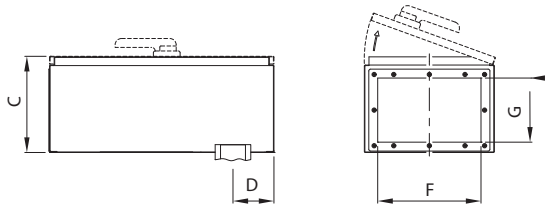
Fiberglass plastic T3
overall dimension

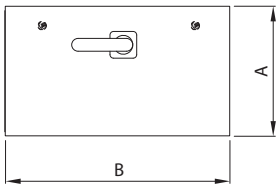


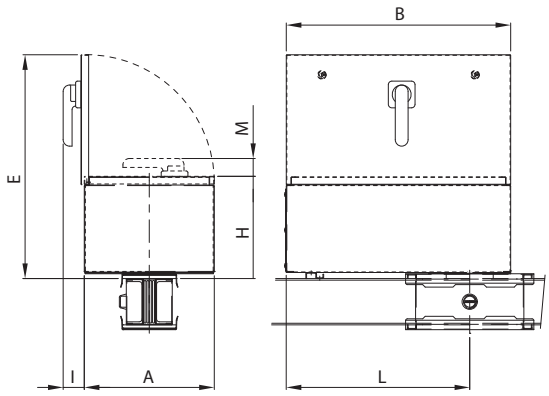
Type 4 (from 125 A to 1250 A)



Type	Rating (A)	A	B	C	D	E	F	G	H	I	L	M
4A	125	365	630	270	115	630	290	180	287	59	520	50
	250											
	400											
4B	630	400	750	280	115	675	290	180	297	74	640	64
4C	800	450	1050	300	115	745	380	210	317	74	940	64
	1000											
	1250											

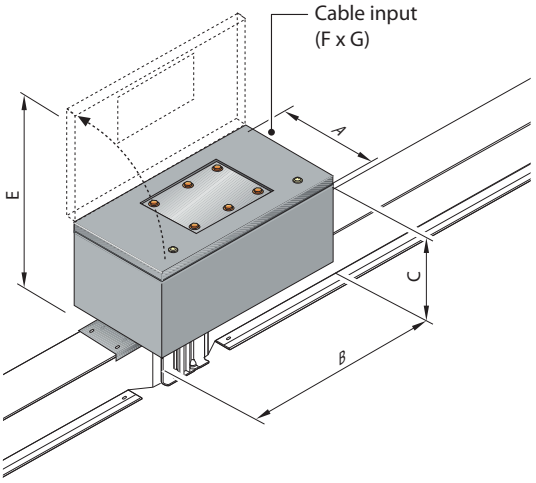


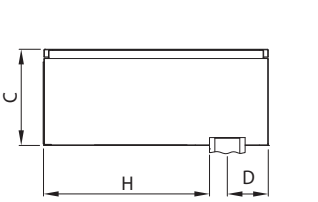


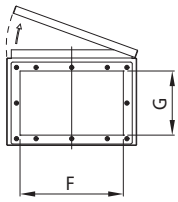


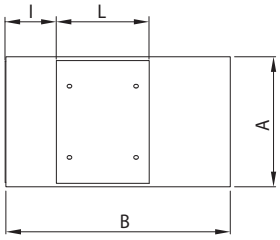
3. Installation

Type 5 - from 125 A to 1250 A









L - Metal internal plate
H - Usable internal space

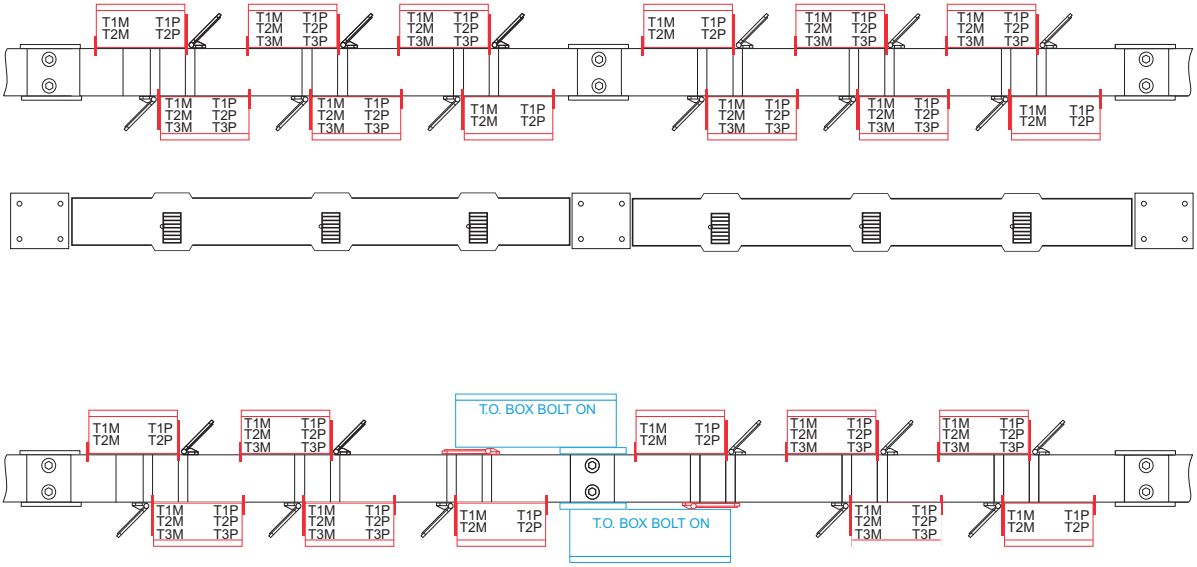
Type	Rating (A)	A	B	C	D	E	F	G	H	I	L
5A	125	365	630	270	115	630	290	180	465	142	260
	250										
	400										
5B	630	400	750	280	115	675	290	180	585	227	295
5C	800	450	1050	300	115	745	380	210	885	254	545
	1000										
	1250										

Not all boxes can be installed in any position.

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

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

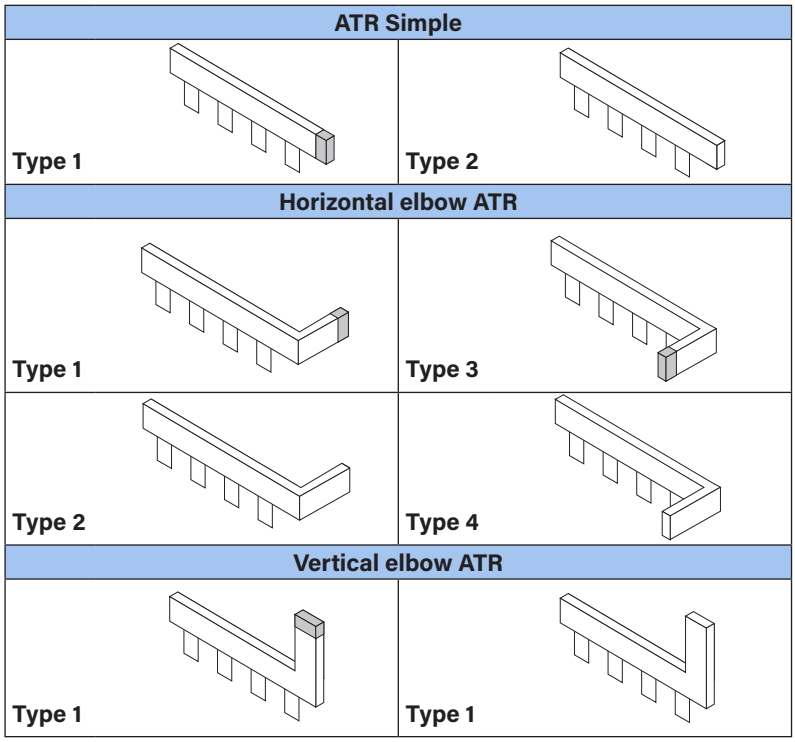
Different combination of boxes in straight elements of XCP:

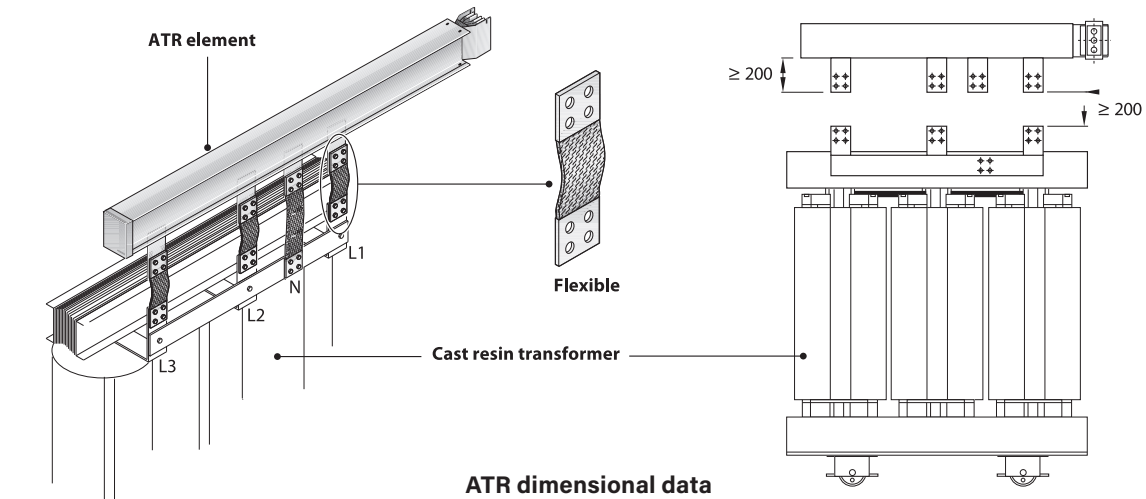


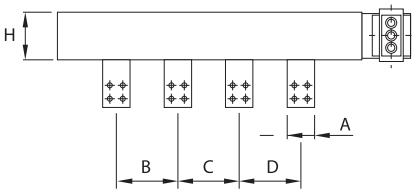
3. Installation

3.4.3 ATR elements

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







L3 L2 Pen (N) L1
L3 Pen (N) L2 L1
L1 L2 Pen (N) L3
L1 Pen (N) L2 L3

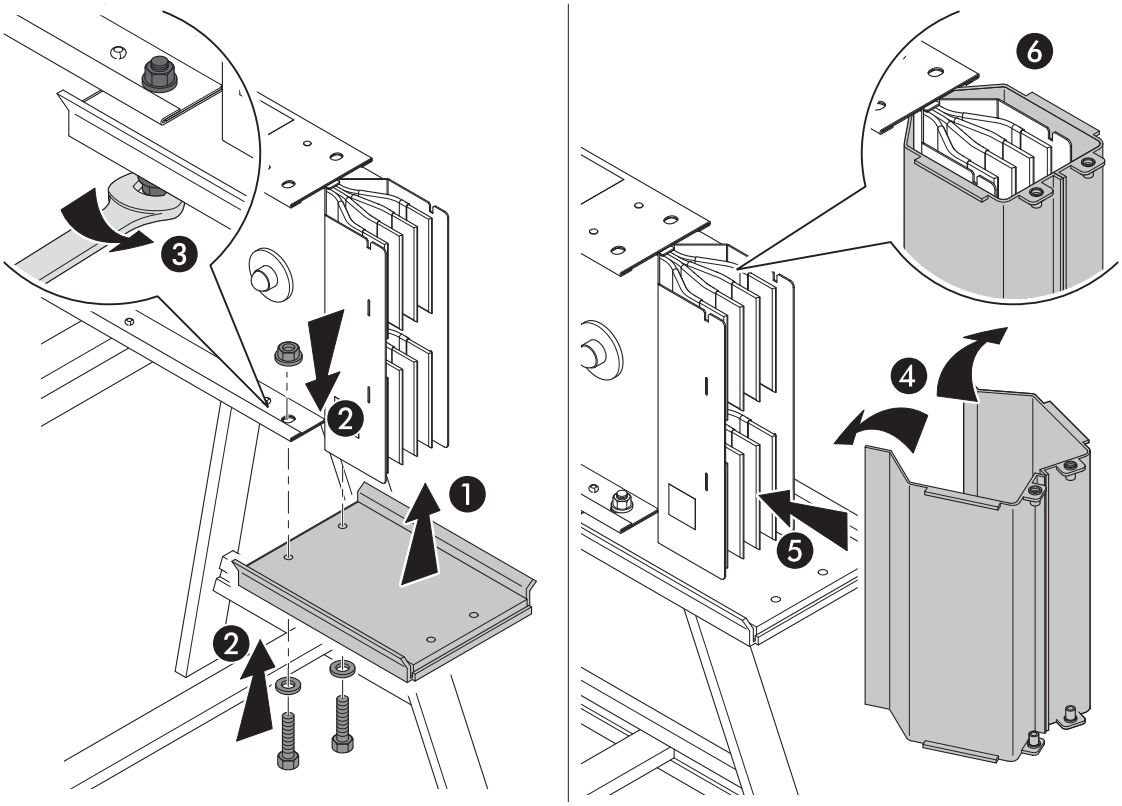
Possible configuration for connection to transformers

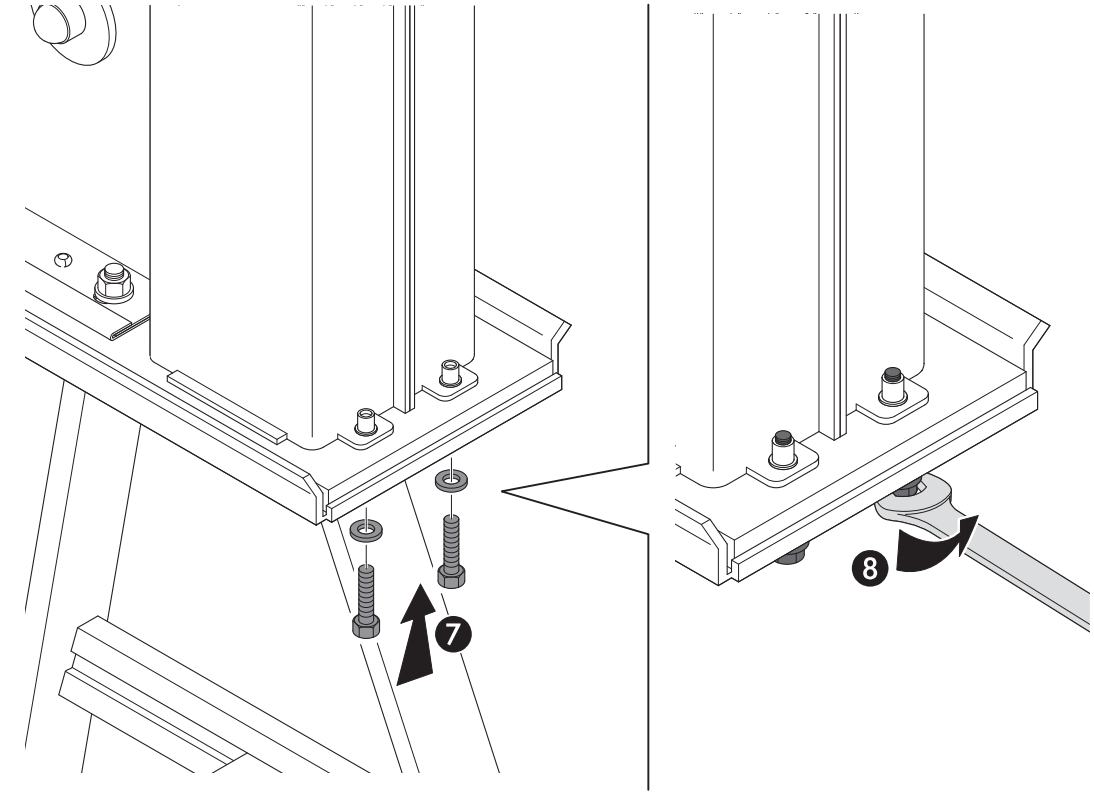
ATR dimensional data

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

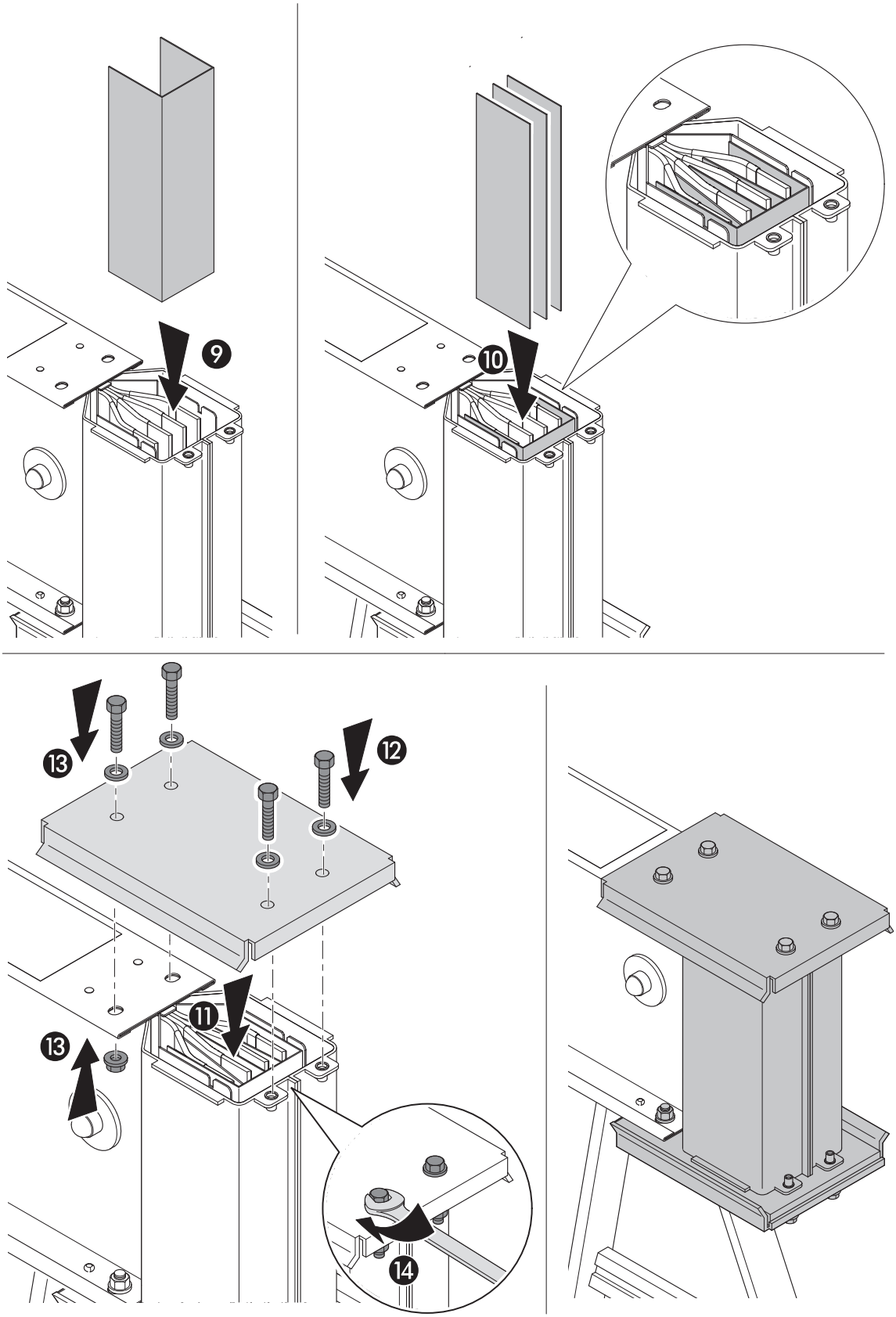
INTERAXES (mm)											
	Al						Cu				
In (A)	A	B	C	D	H	A	B	C	D	H
630	75	165	165	165	130	-	-	-	-	-
800	110	165	165	165	130	75	165	165	165	130
1000	110	165	165	165	130	110	165	165	165	130
1250	120	165	165	165	130	110	165	165	165	130
1600	155	205	205	205	170	150	205	205	205	170
2000	205	255	255	255	220	160	205	205	205	170
2500	150	205	205	205	380	200	255	255	255	220
3200	180	235	235	235	440	150	205	205	205	380
4000	205	255	255	255	480	180	235	235	235	440
5000	210	255	255	255	590	200	255	255	255	480
6300	-	-	-	-	-	210	255	255	255	590

3.4.4 End caps



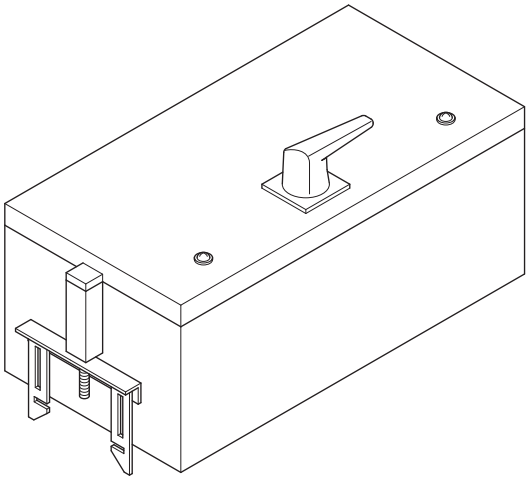


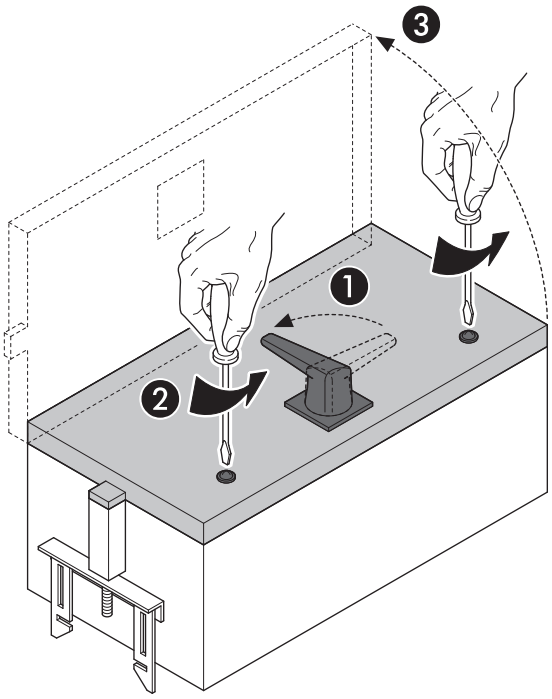
3. Installation

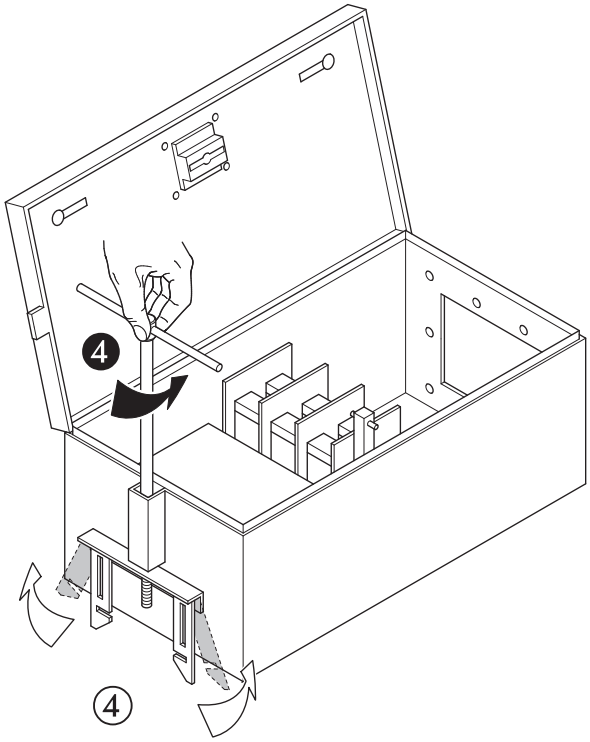


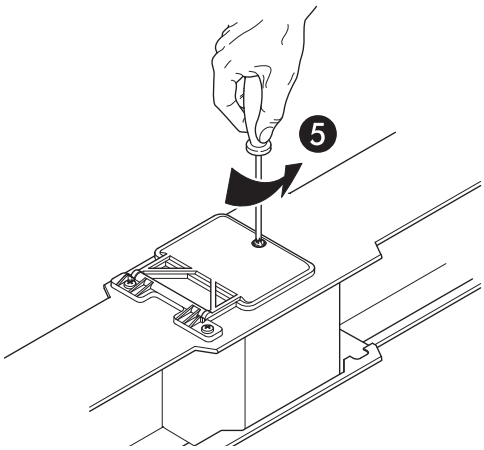
3.4.5 Box installation

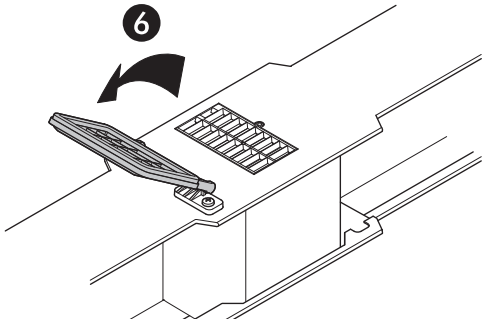
Plug in tap-off box



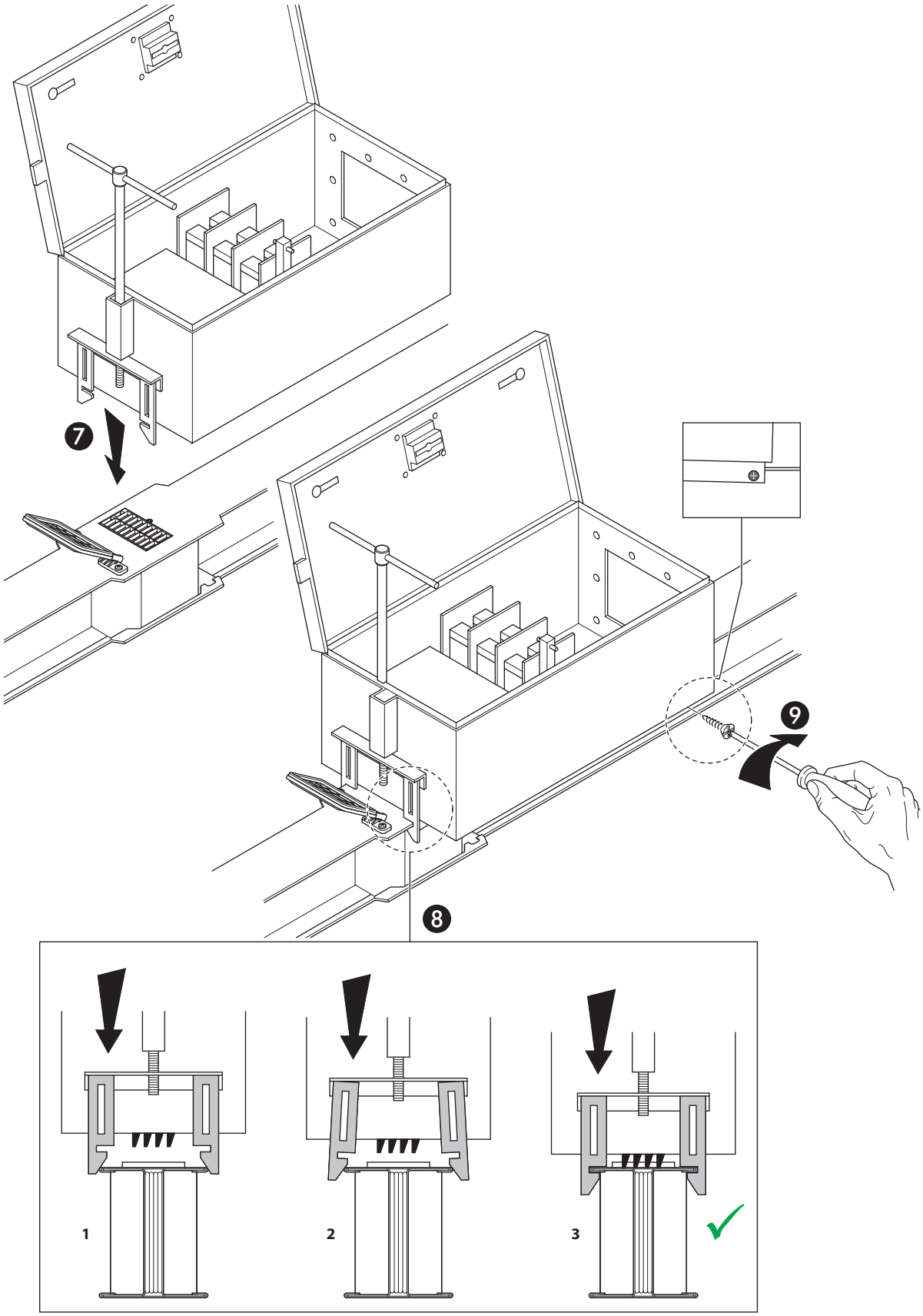


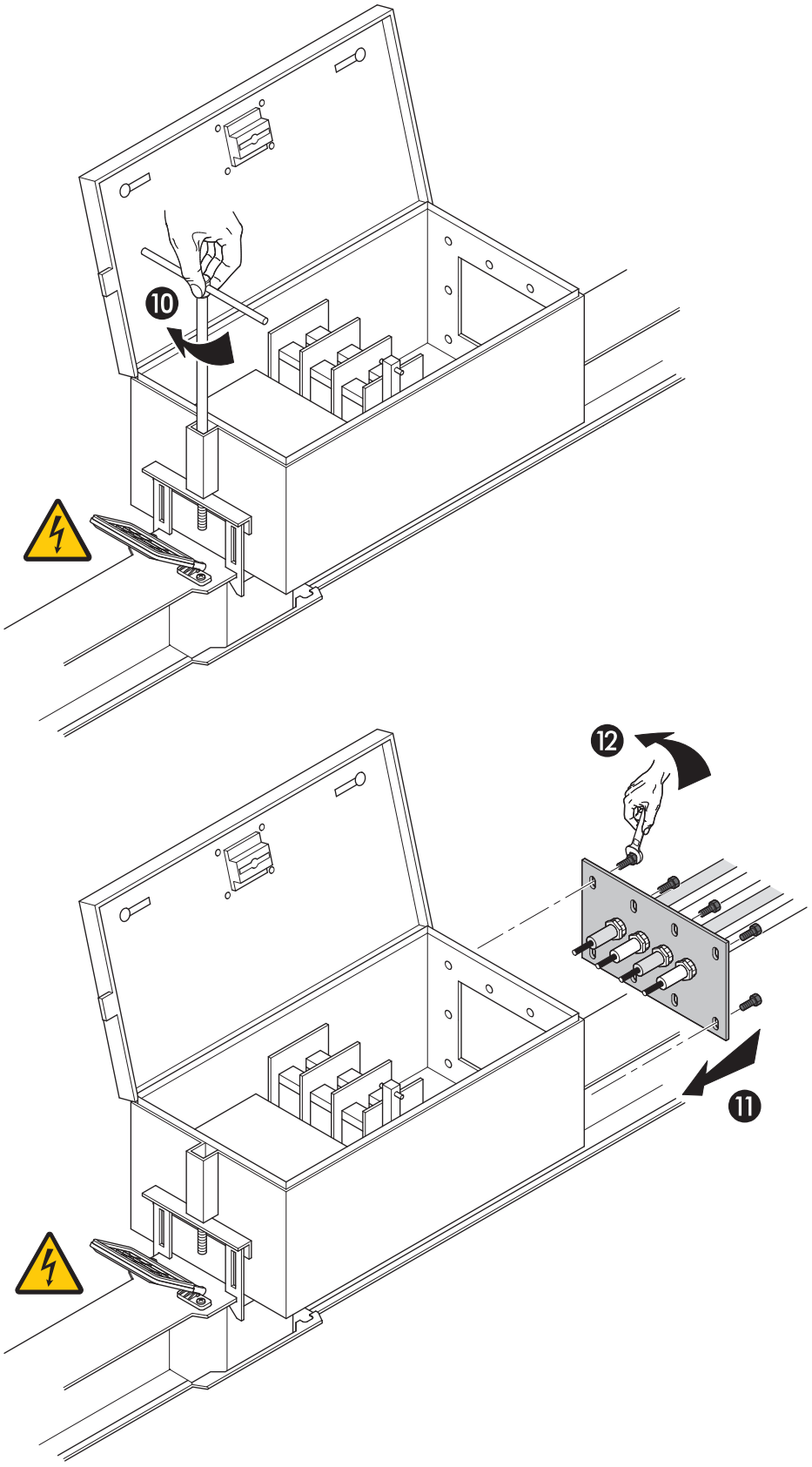




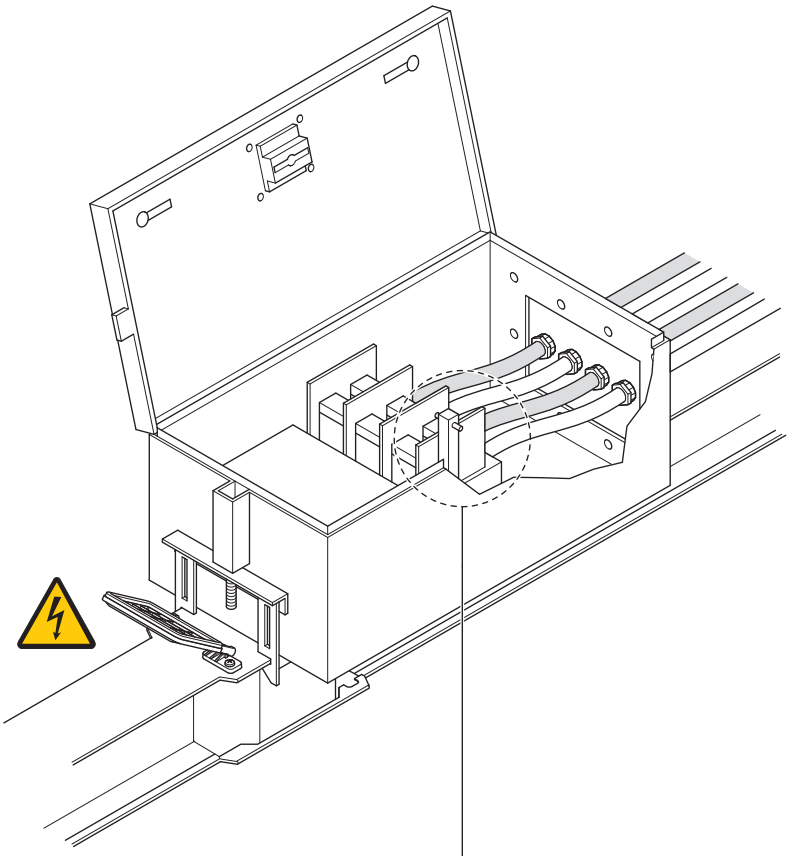


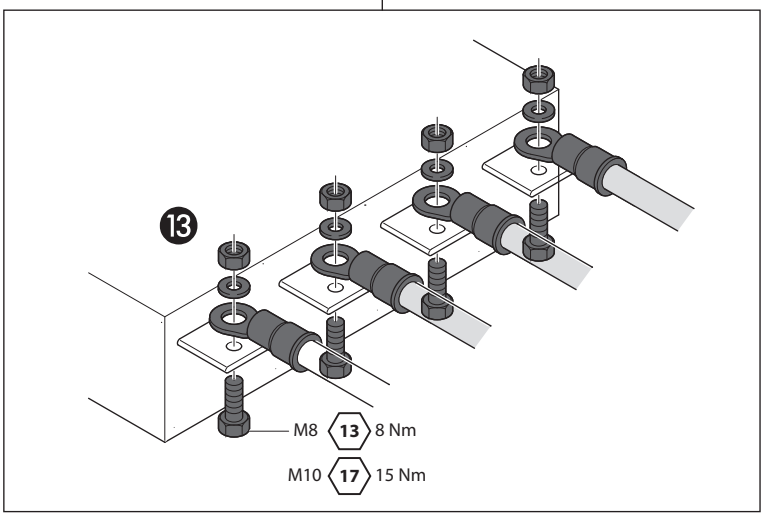
3. Installation

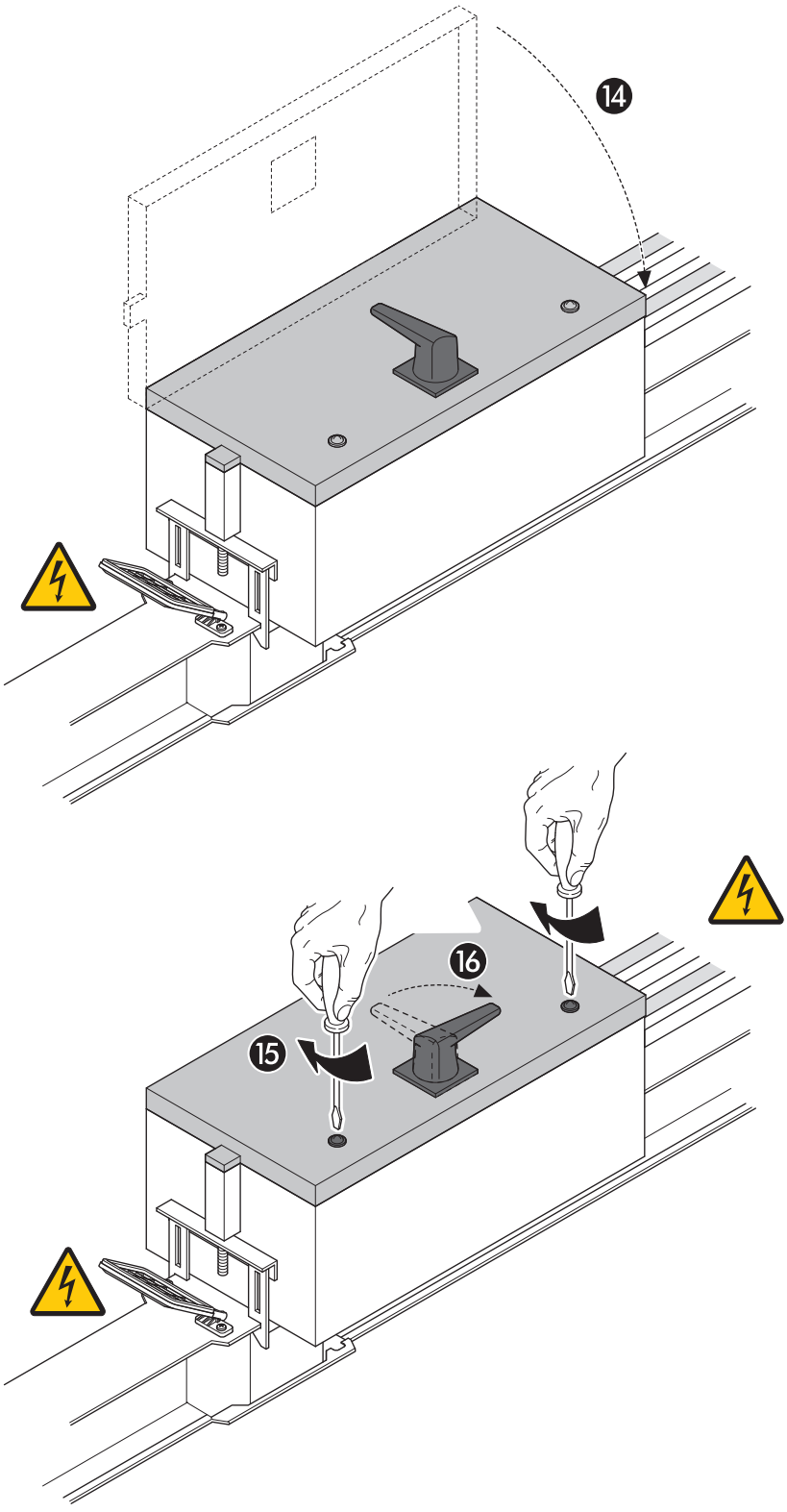



10
12
11

3. Installation



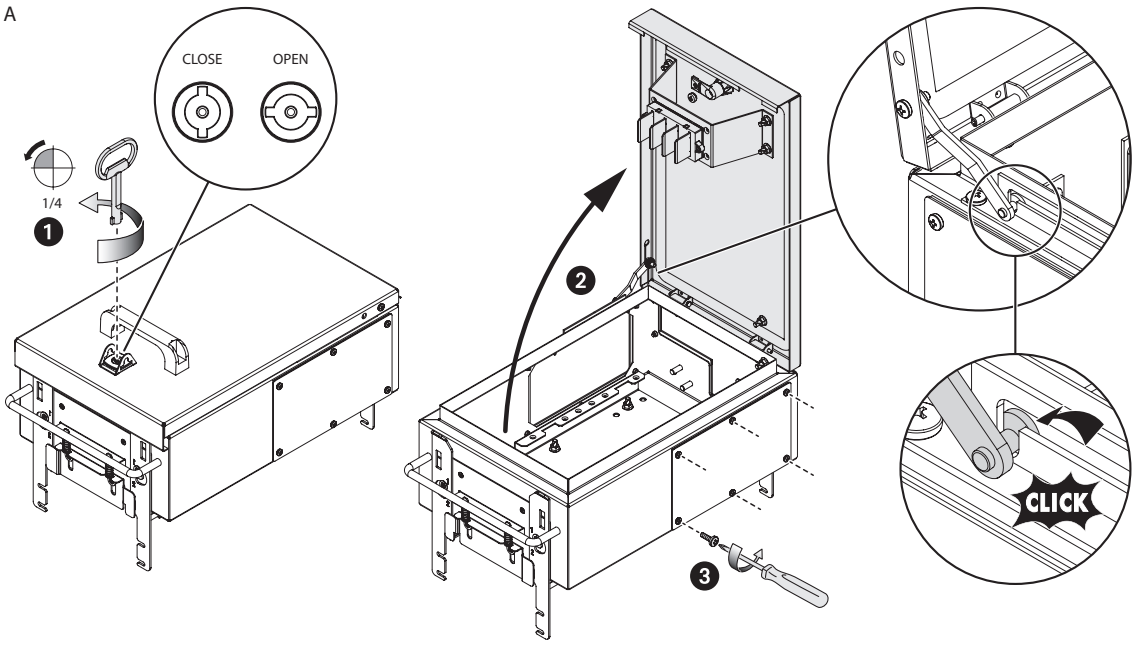


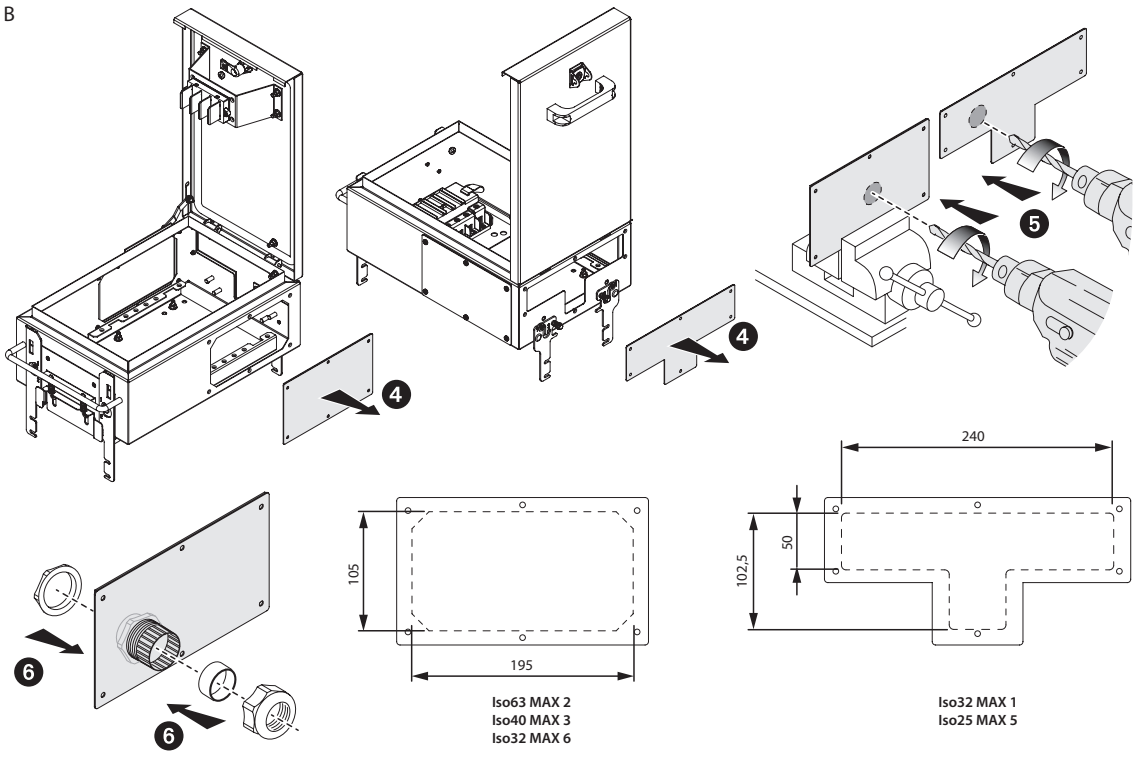

14
16
15

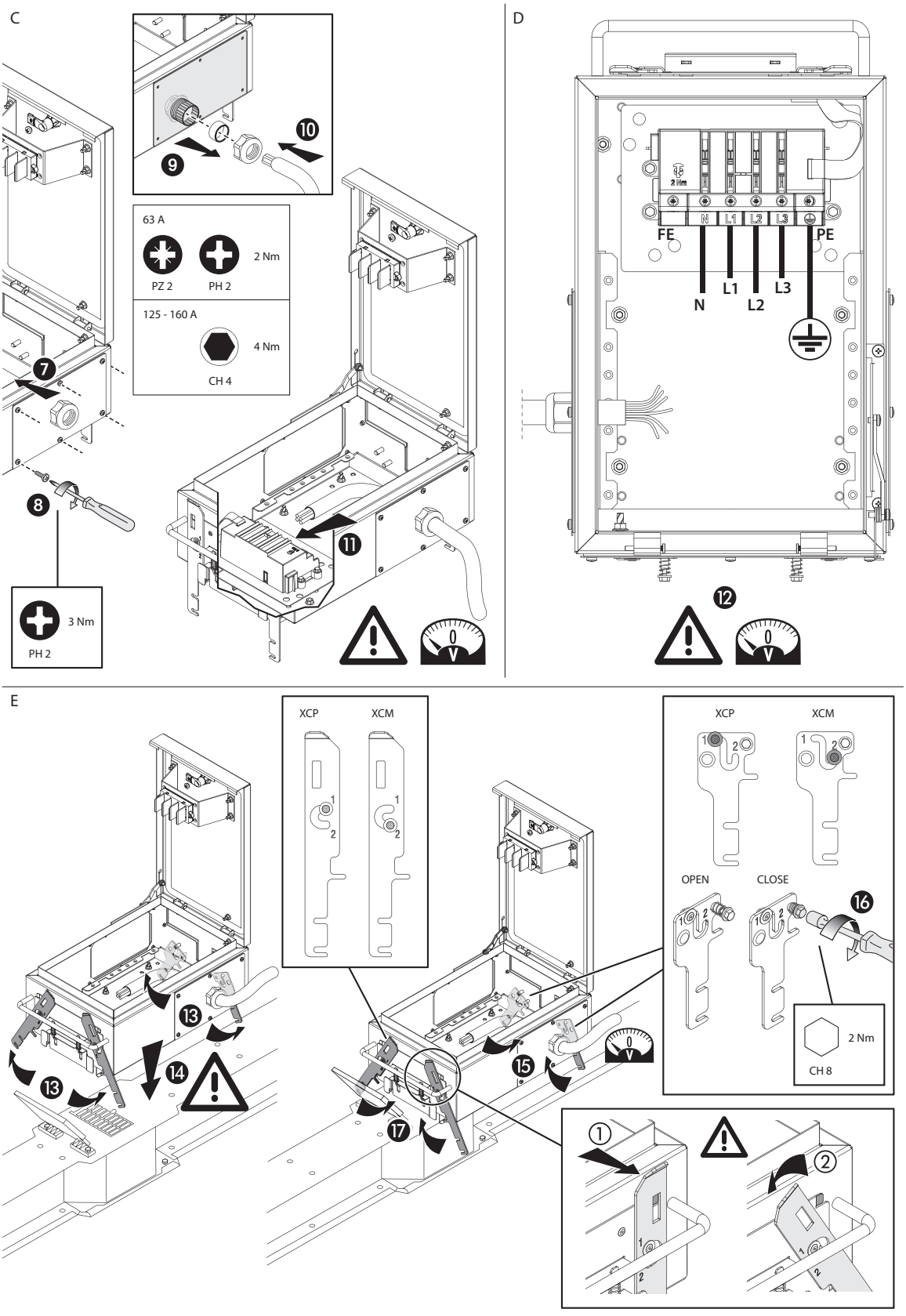
3. Installation

3.4.6 Assembly instruction Plug-In box 63A-125/160A

DANGER
The following operations must be carried out with the voltage disconnected.

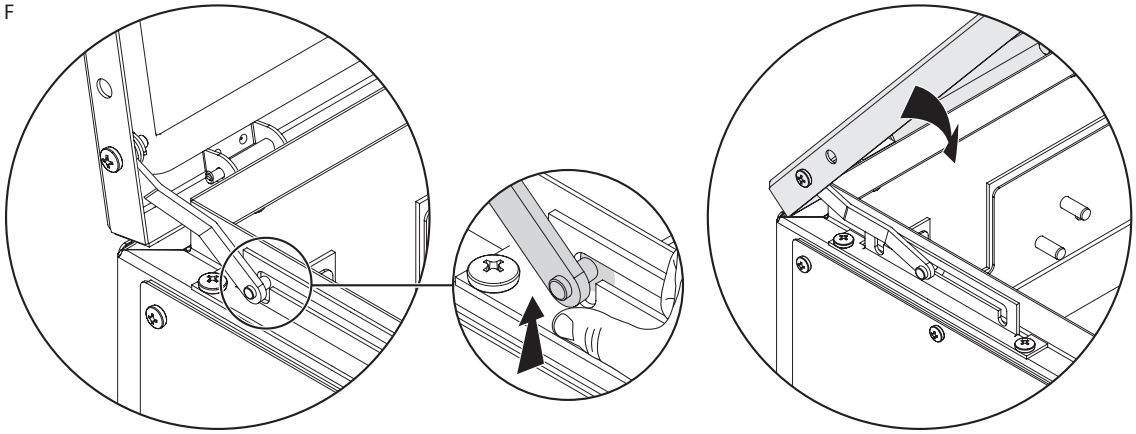




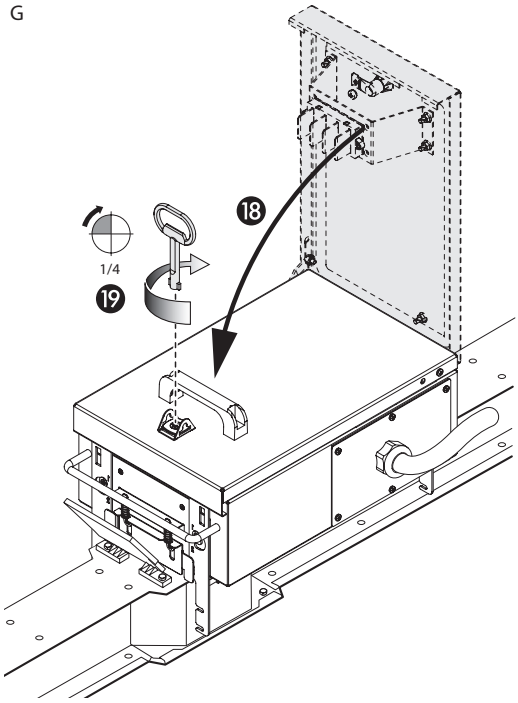

C
63 A
PZ 2
PH 2
2 Nm
125 - 160 A
CH 4
4 Nm
3 Nm
PH 2
D
FE
N
L1
L2
L3
PE
E
XCP
XCM
OPEN
CLOSE
2 Nm
CH 8

3. Installation

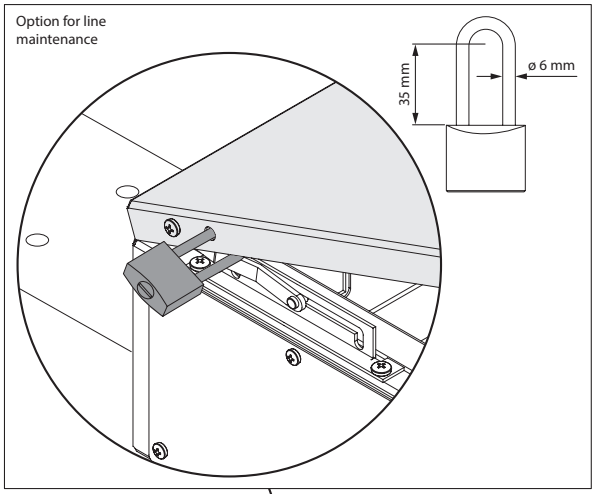
F

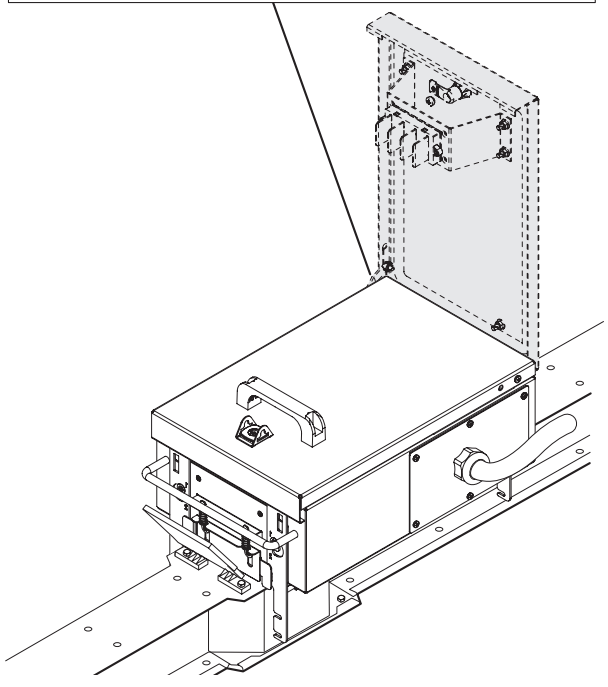


G

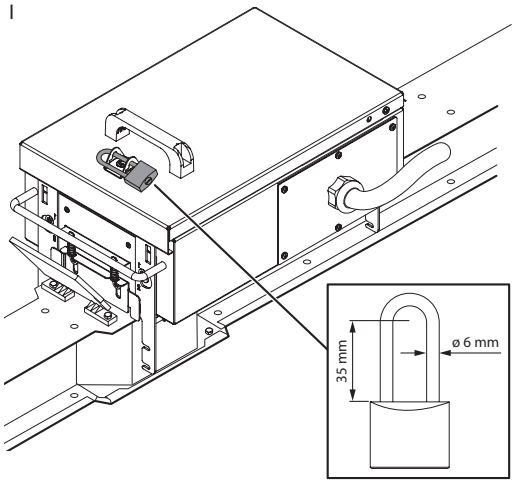


H





I

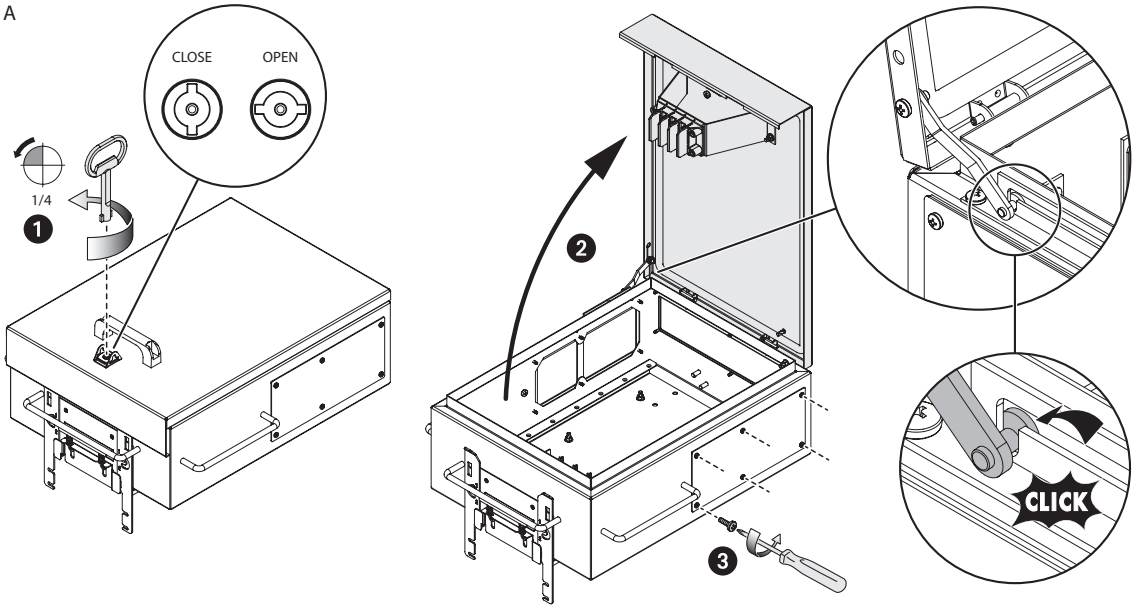


3.4.7 Assembly instruction Plug-In box 250A

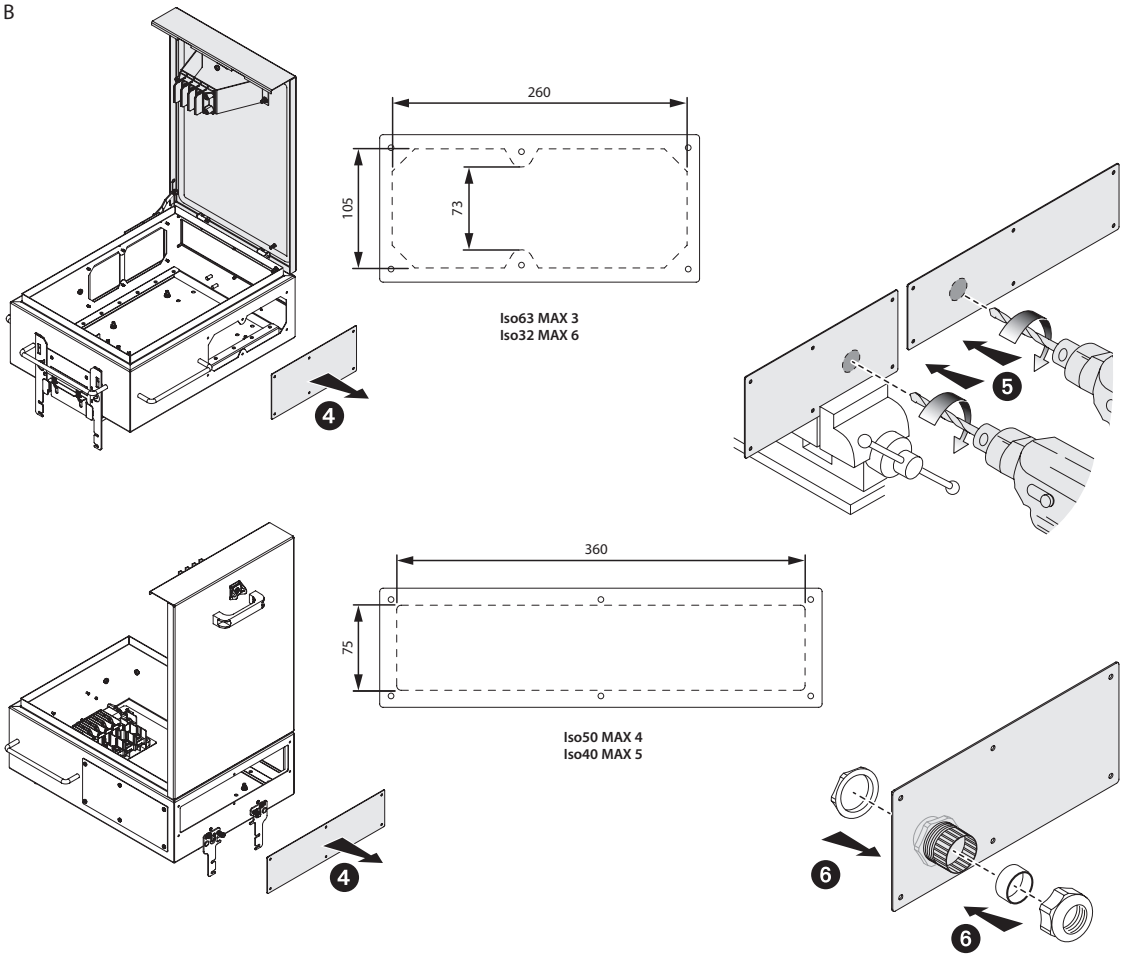
DANGER

The following operations must be carried out with the voltage disconnected.

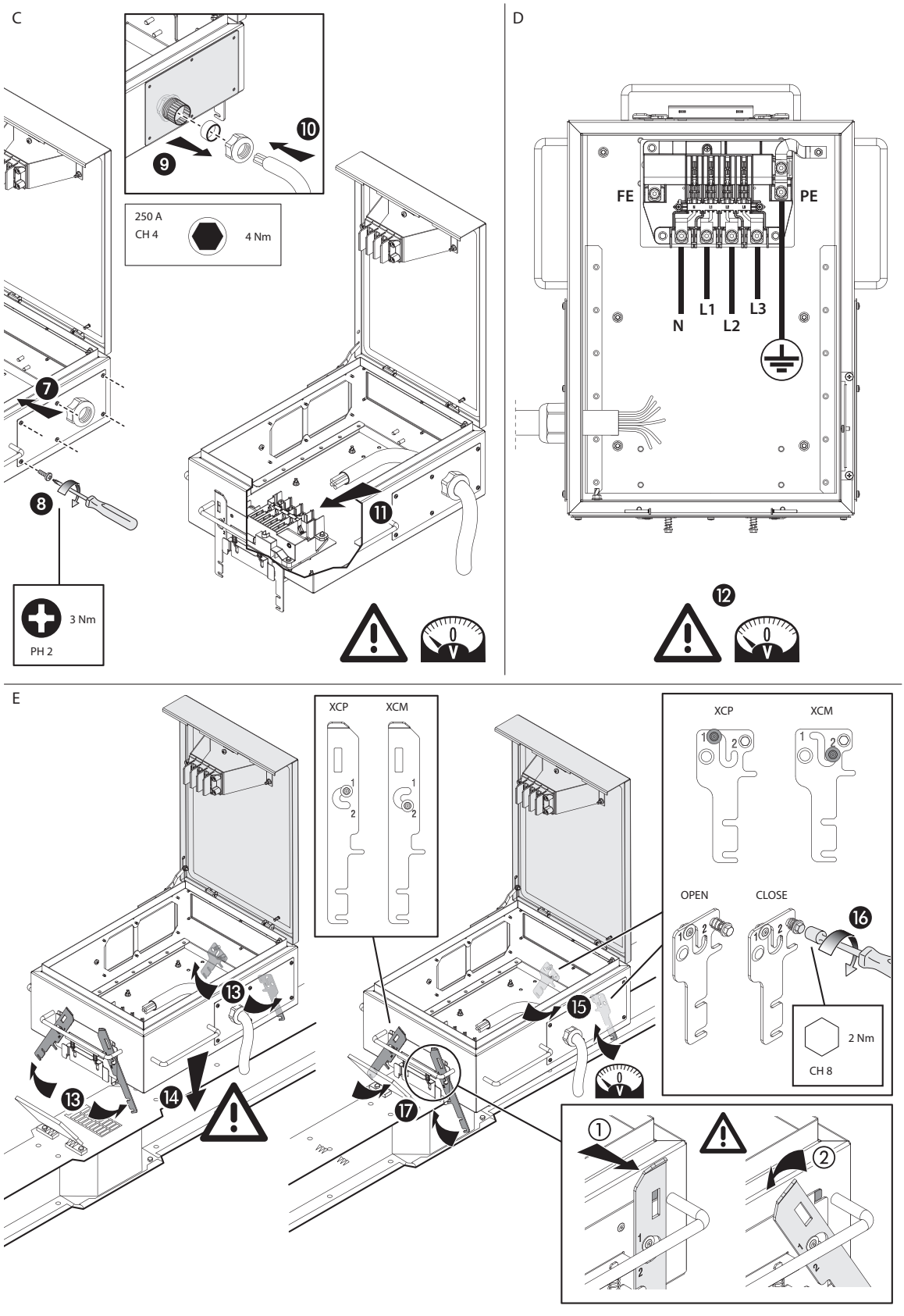
A



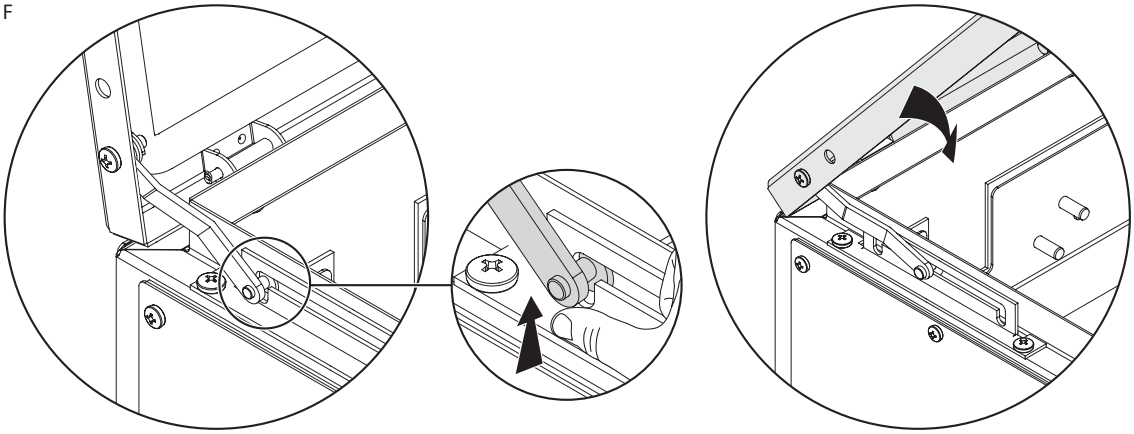
B



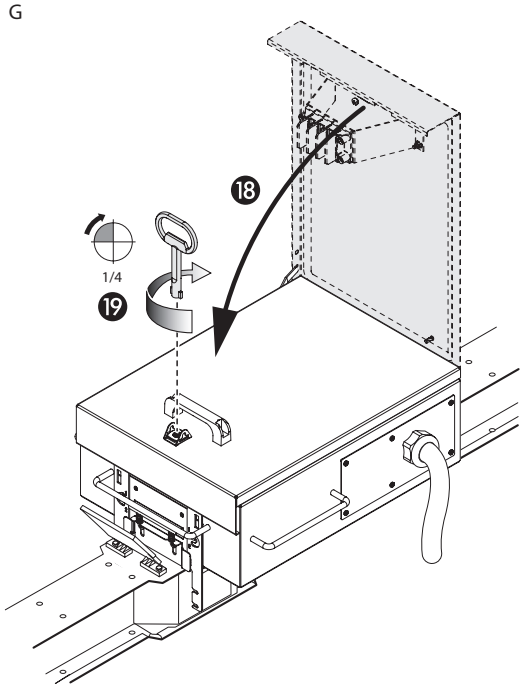
3. Installation



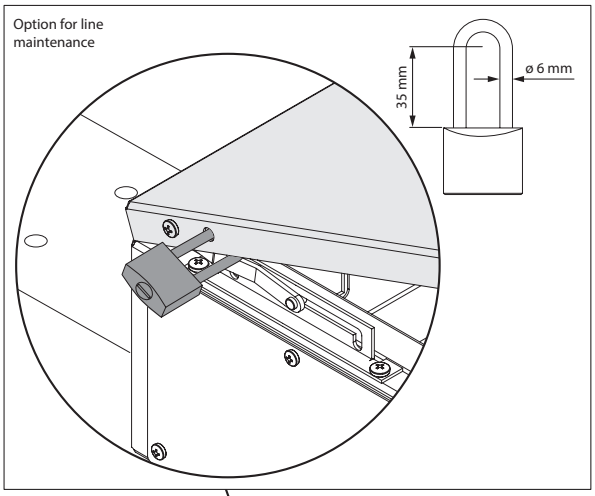
F

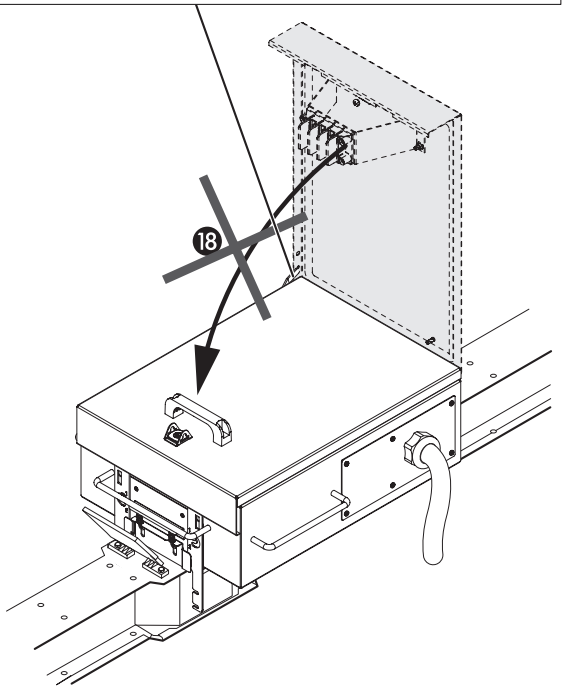


G

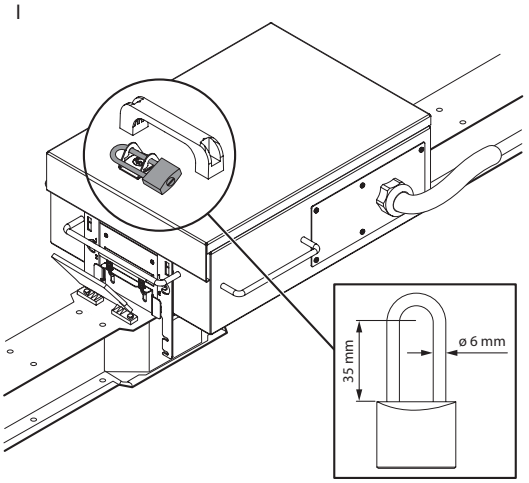


H





I



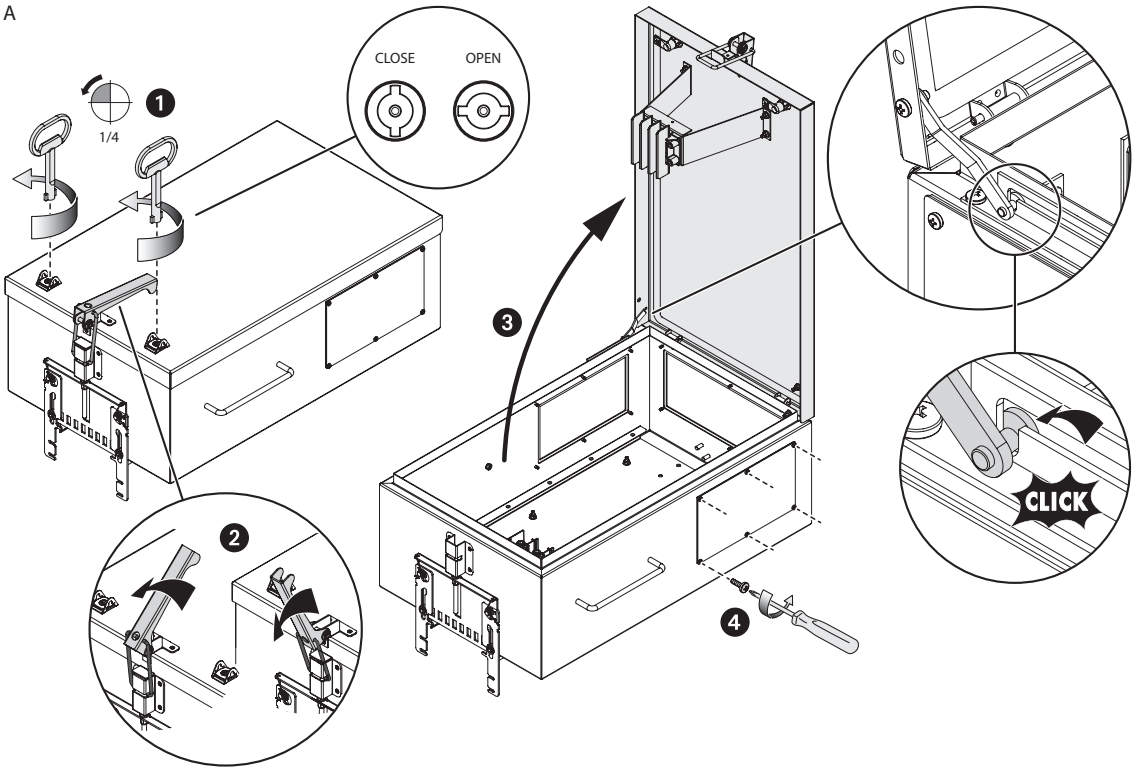
3. Installation

3.4.8 Assembly instruction Plug-In box 630A

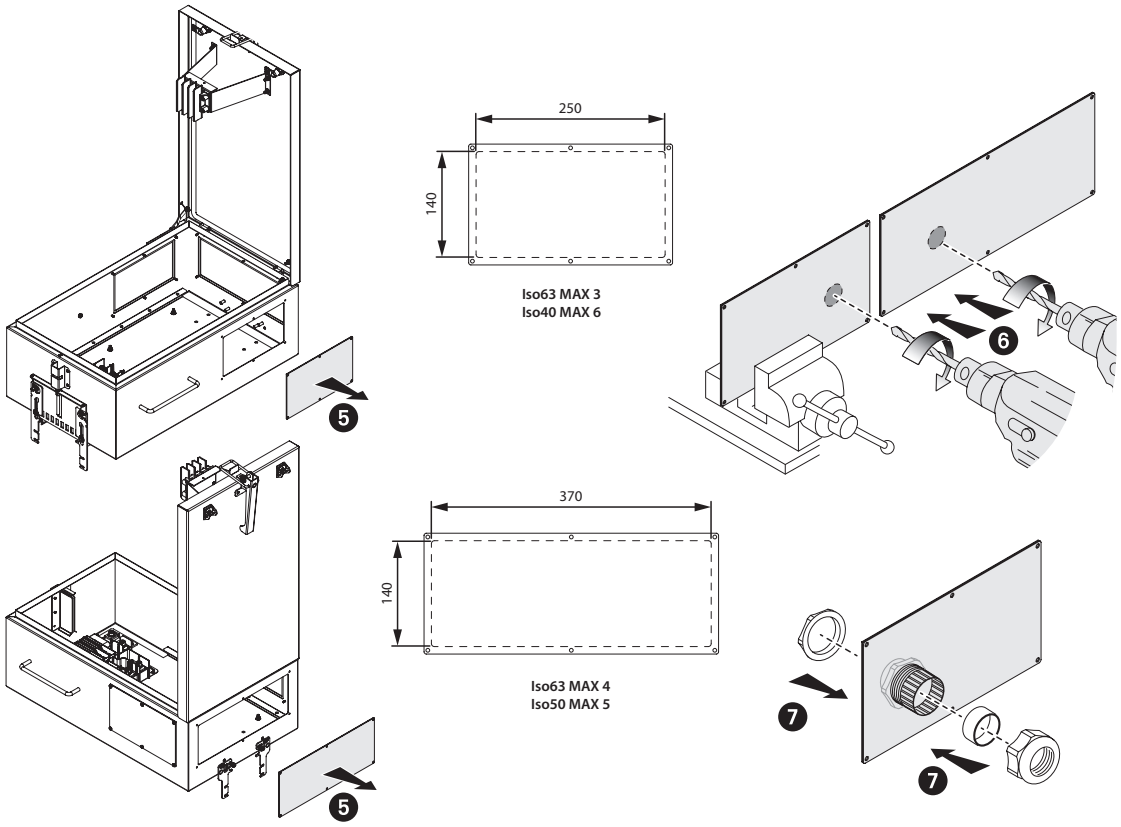
DANGER

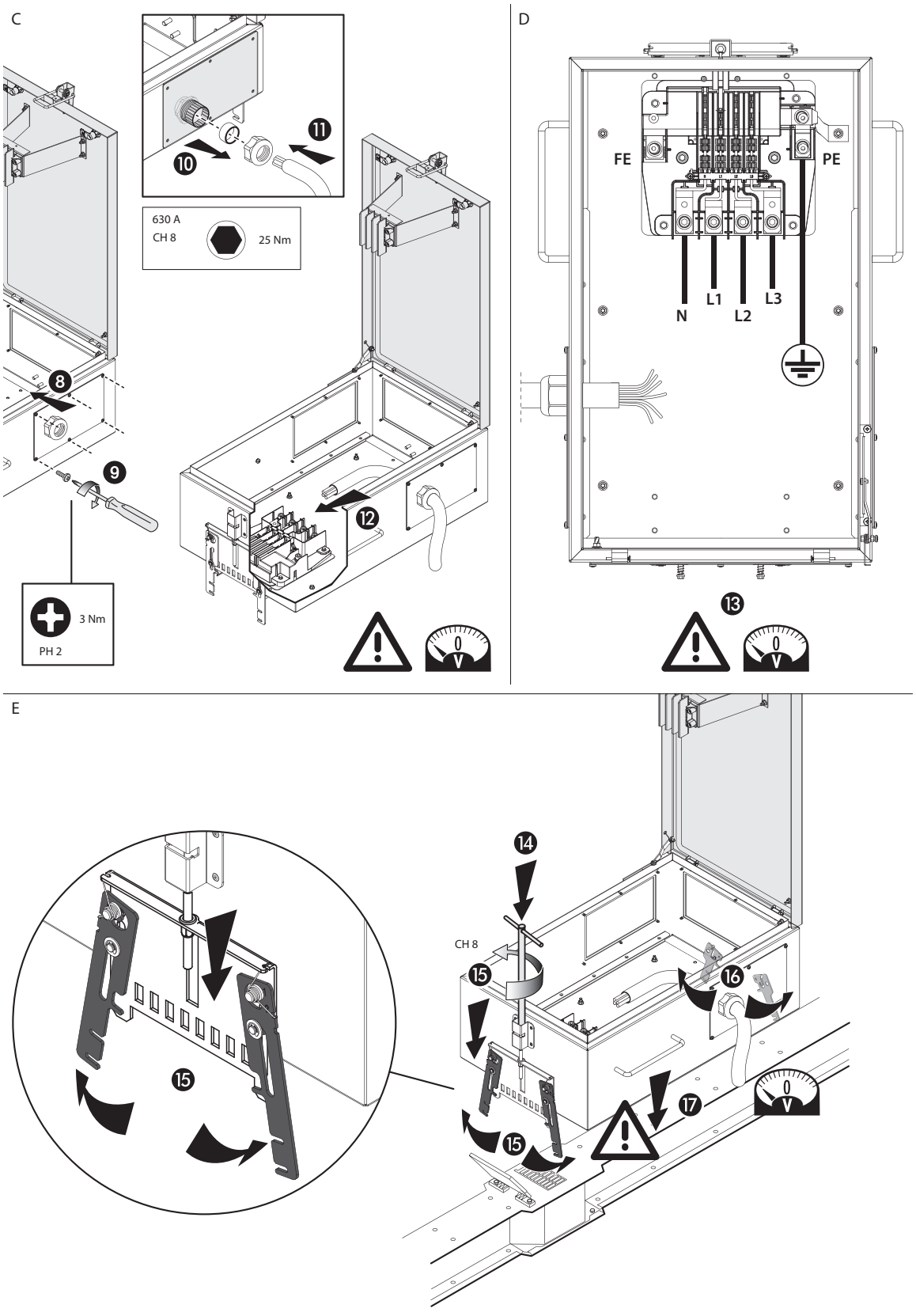
The following operations must be carried out with the voltage disconnected.

A



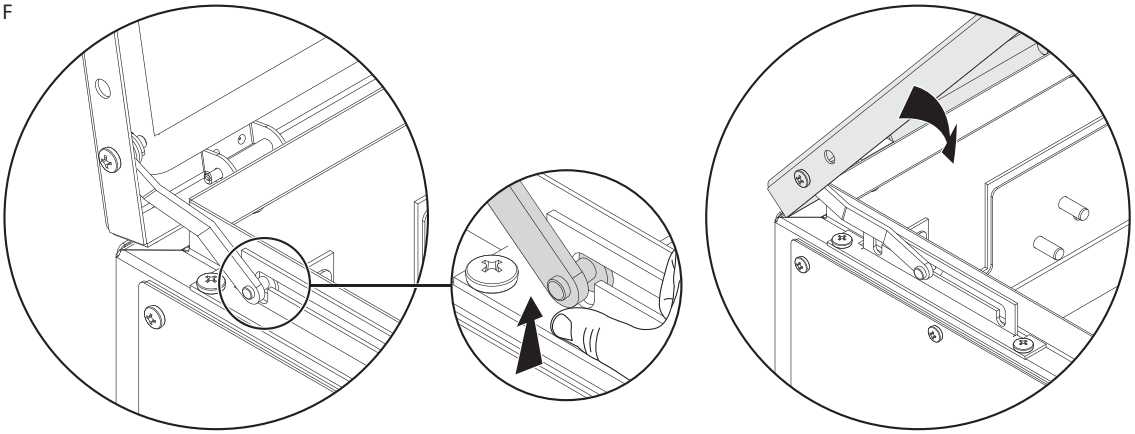
B



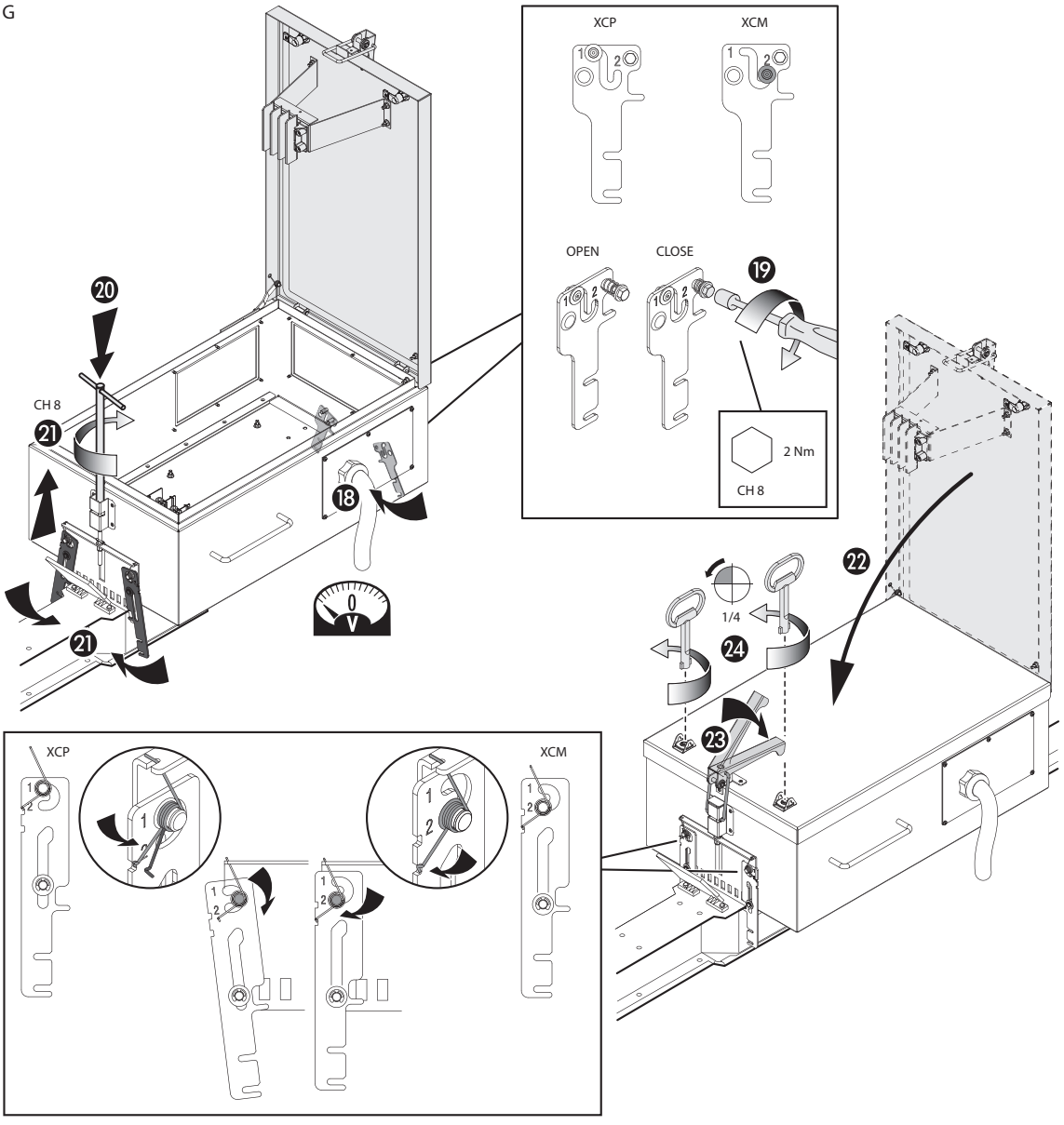

C
630 A
CH 8
25 Nm
3 Nm
PH 2
D
FE
PE
N
L1
L2
L3
E
CH 8

3. Installation

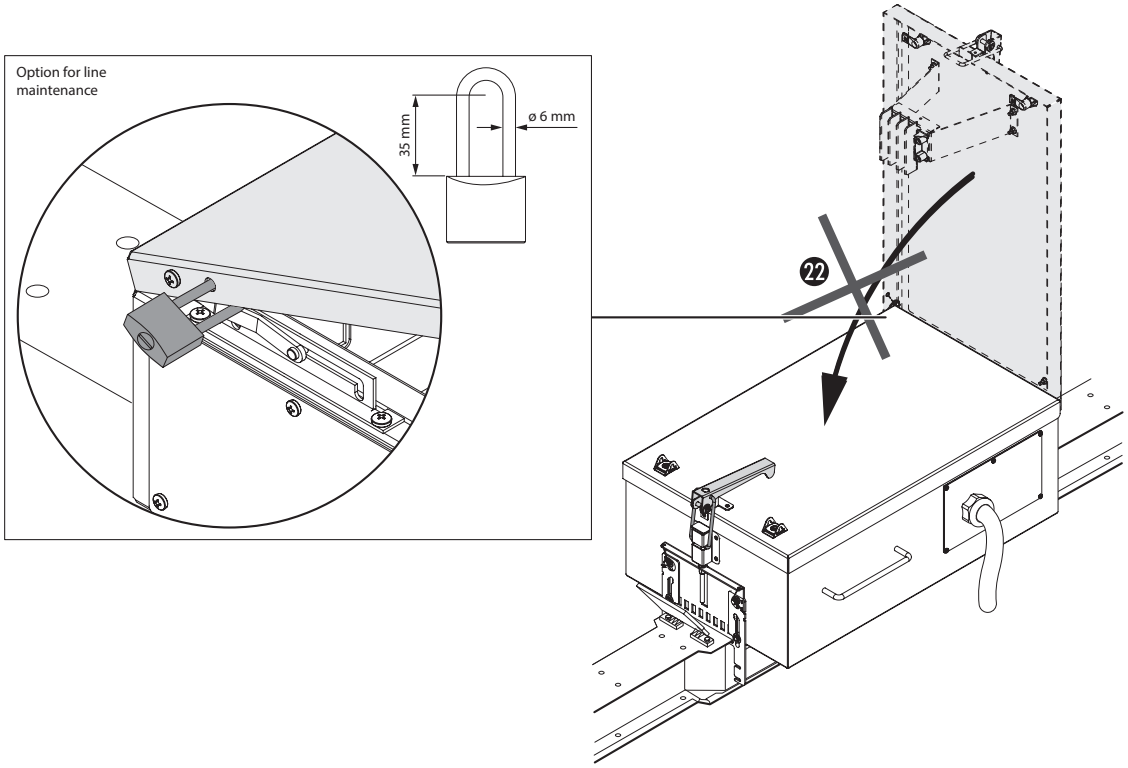
F



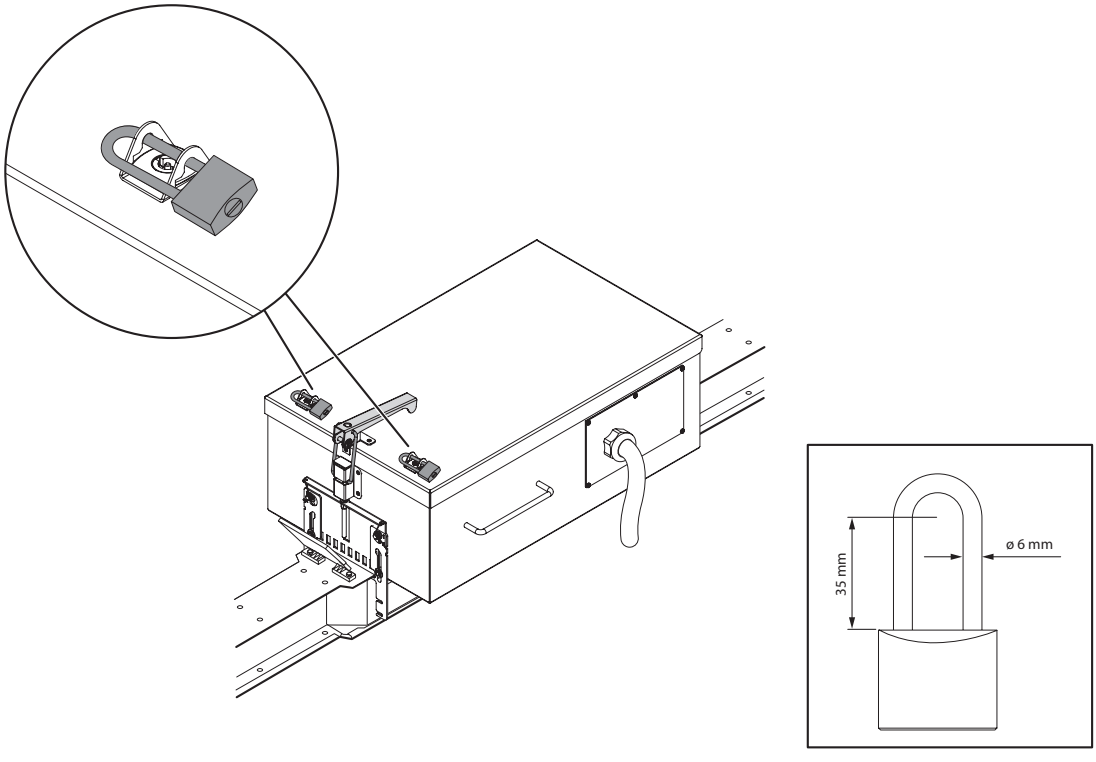
G



H

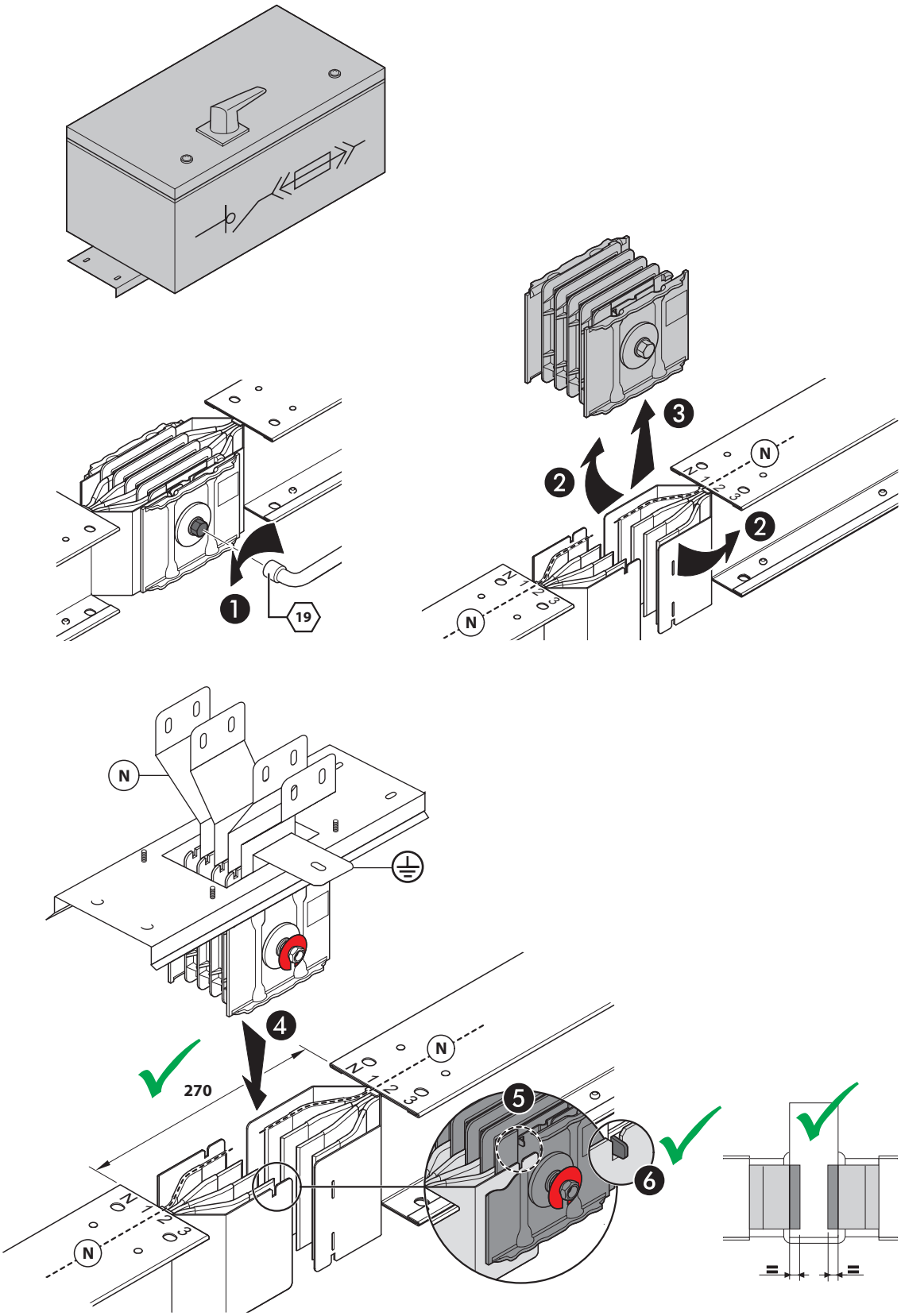


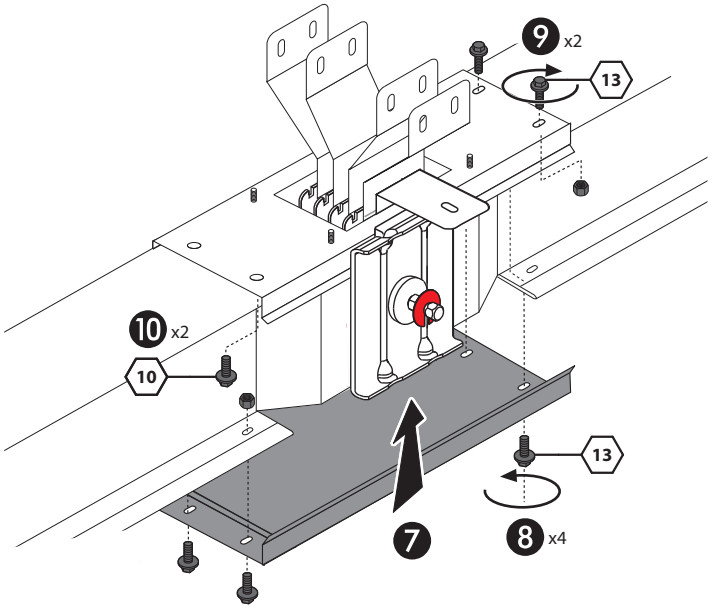
I

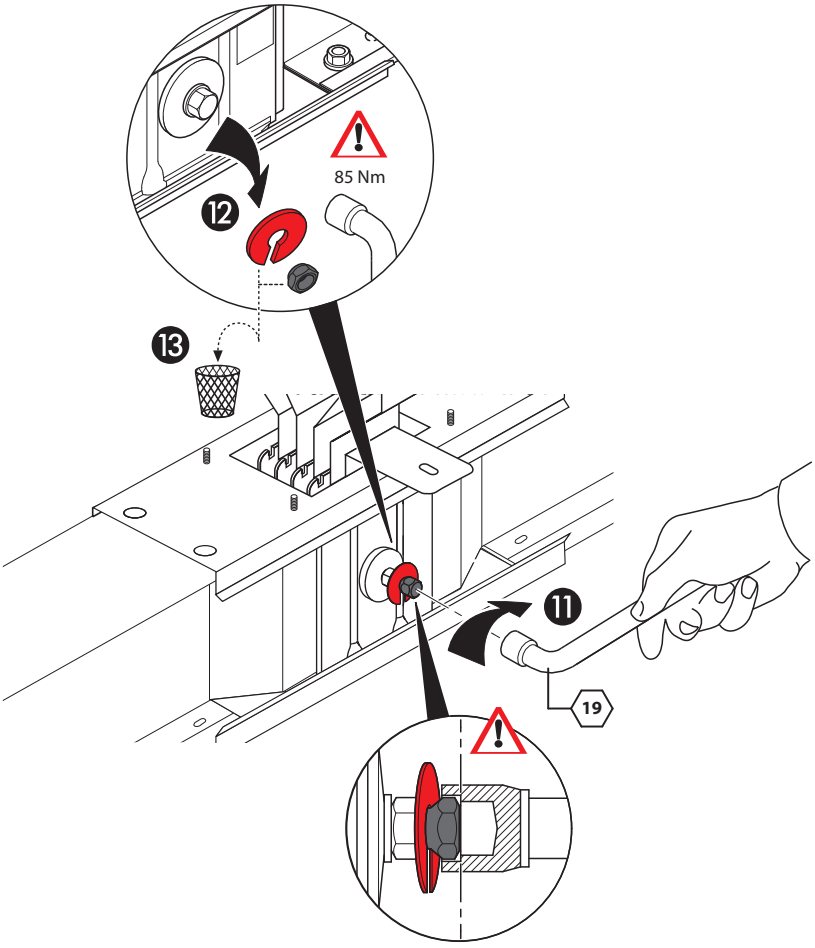


3. Installation

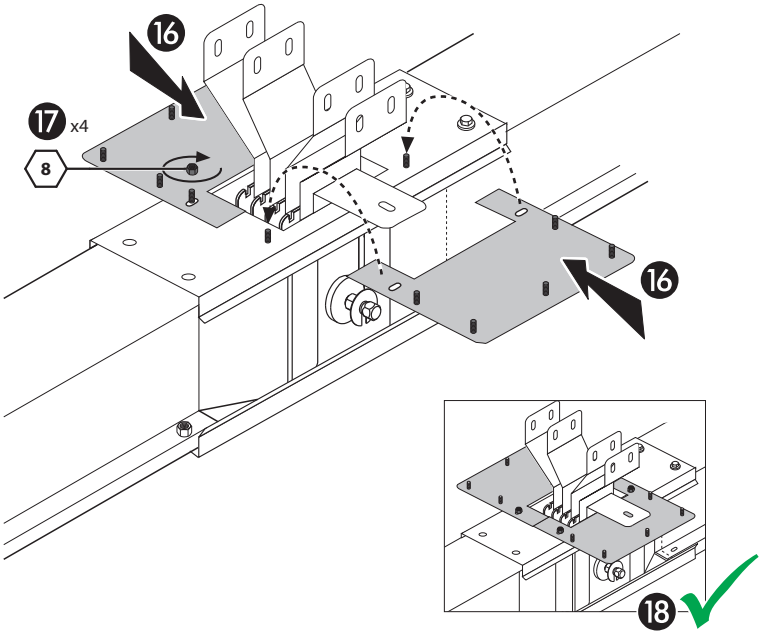
Bolt on tap-off box

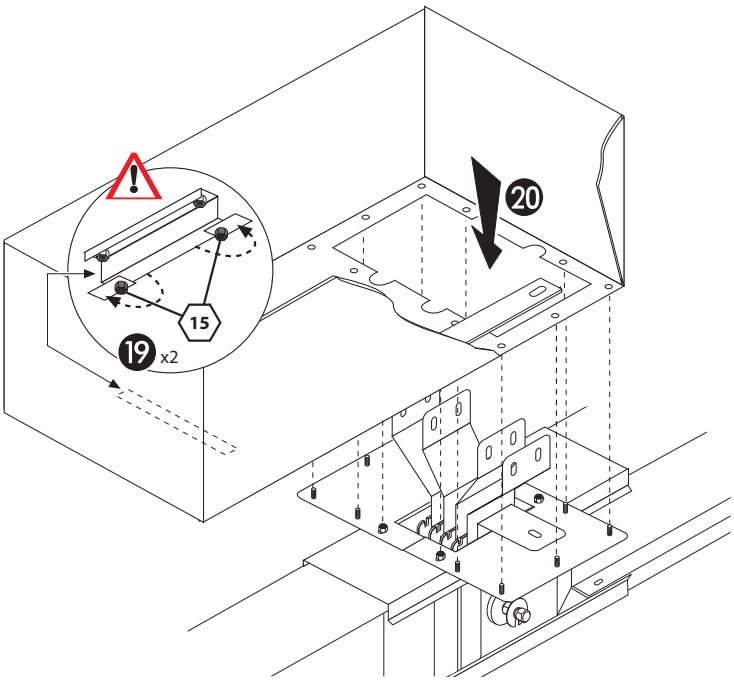


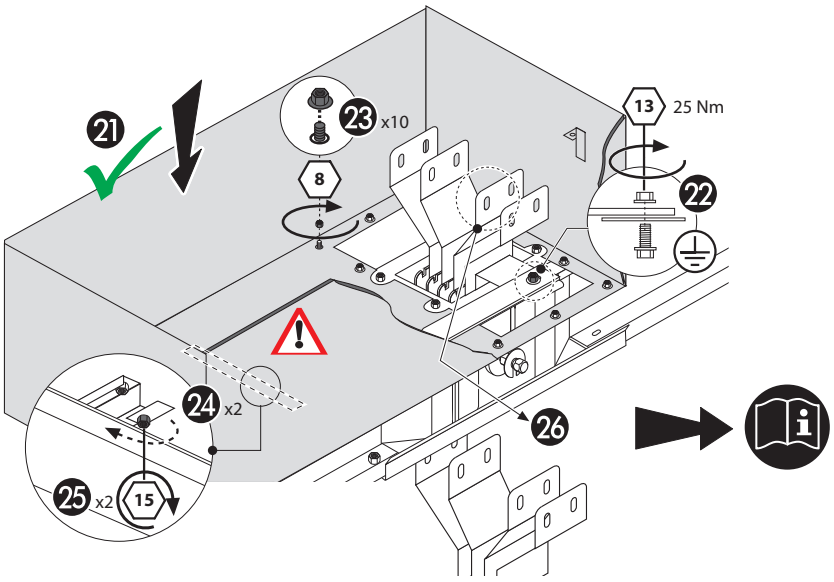

9 x2
13
10 x2
10
13
7
8 x4

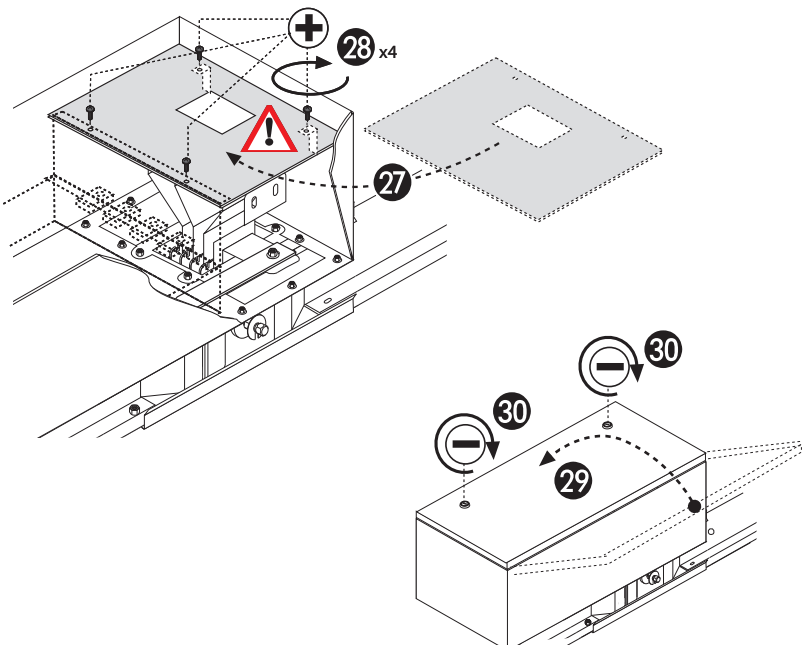

85 Nm
12
13
11
19

3. Installation



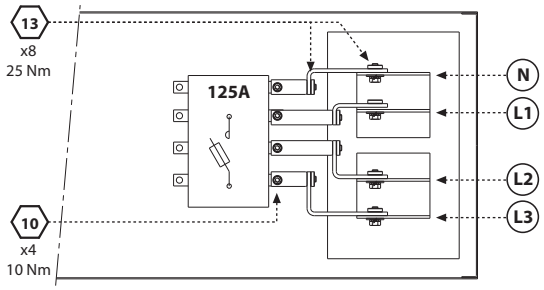


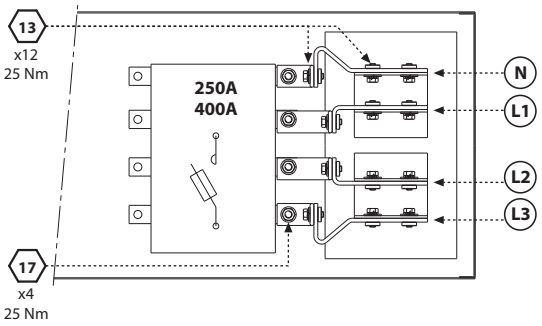

21
23 x10
8
13 25 Nm
22
24 x2
25 x2
15
26

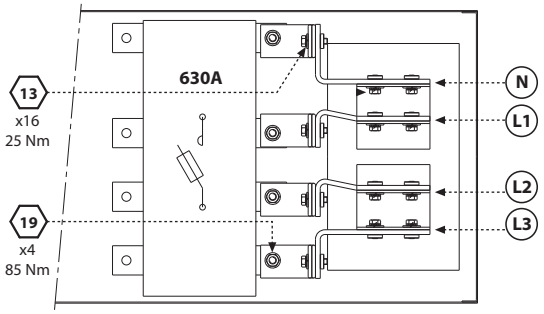

28 x4
27
30
30
29

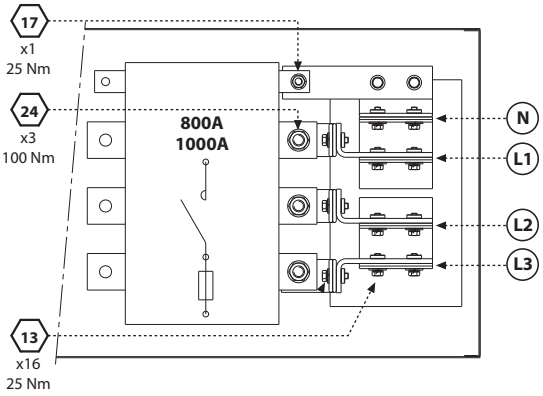
3. Installation

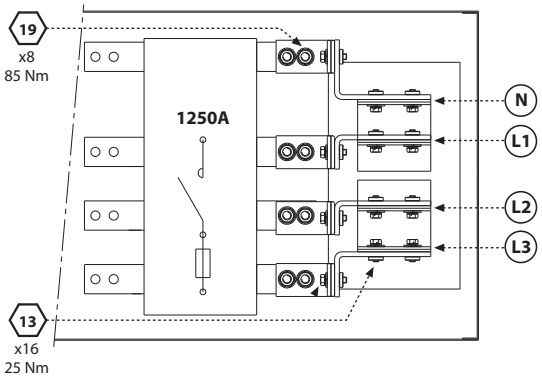
Connection bridges for tap-off box bolt-on type











3.4.9 Busbar post-installation checks

Bus duct inspections after installation
After installation, following inspections have to be carried out before running the plant:

Bus duct installation
Check if elements are correctly aligned. If not, align them correctly.

JUNCTIONS
Open a random sample (10%) of mechanical junctions and verify that:

1 the block has been installed in the correct direction and that the mechanical guides (pins and slots) correctly correspond. If not, remove the block and mount it again correctly, after checking it is sound. Otherwise wholly replace it.
2 plastics are sound, in particular that there are neither slits nor chips, and that there is neither dust nor grime. If the insulating parts are damaged, wholly replace the monobloc. If there are dust or grime, clean them off.
3 the block is correctly centred with the bars of the element. If not, centre it after having checked it is undamaged.
4 the torque moment of the self-breaking bolts is correct (80-90 Nm), use a calibrated torque wrench. During the measurement the line has to be at ambient temperature. If the torque moment is lower than the specified value, re-establish it.

SWITCHBOARD CONNECTION
On switchboard connections verify that:

1 the air distances between bars with different potentials are over 40 mm wide. If it is not the case, contact Eng. Dept. Starline Brand to evaluate the employment of correct insulating material.
2 the torque moment of connecting screws is correct (required values: 85 Nm for M12, 100 Nm for M14, 120 Nm for M16, 170 Nm for M18, 25 Nm for M8 and 50 Nm for M10).

The above-mentioned inspections have to be carried out by personnel with a proper technical background and with controlling function/responsibility in the installation activities.

Tap-off boxes inspections after installation
These inspections always have to be carried out with a non-energized plant and after having earthed the phases after the tap-off box, in order to unload possible static discharges in the downstream circuit (with an insulated device).

BOLT-ON
Carry out the same inspections planned for junctions. Verify the correct torque moment of the screws joining the mechanical junction and the collector bars. If necessary, retighten the connecting screws.

4. Starting-up

4.1 Busbar pre-energising checks

4.1.1 Electrical safety tests

Carry out all tests described in the applicable technical installation norms, as the insulating test between phases neutral and to earth at 1000 V with a minimum value of 1MΩ, for every line stretch. If the insulating value is lower than 1MΩ, it is necessary to verify the plant completely, starting from the insulating parts of each monobloc. If the insulation is still inadequate, divide the plant in two parts and verify the single stretch to identify the element with low insulation. Continue the splitting, if the insulation keeps being inadequate. If insulation test is made to every piece the value minimal is 100MΩ.

4.2 Electric checks

4.2.1 Conductors

Thermal tests

After having path the plant at the maximal working current, and having let it work for at least 6 hours, carry out a thermal test. Stick labels on the hottest parts and mark them with progressive numbers to identify the element. Carry out the thermal test again on the labels. Fill the attached form with the measured values, together with ambient temperature and working current (forms for thermal tests at pages 115-117). Thermal tests can be carried out with contact temperature sensors, with optical pyrometers or thermal cameras.

4.2.2 Tap-off boxes

Plug-in

Verify the contact resistance between the clamp before the protective device and the relative bar in the upstream outlet. If resistance is higher than 100μΩ, the tap-off box could have been mounted not correctly. Take off the tap-off box, verify the plug-block and the outlet of the element. If the outlet is broken and the contacts have entered the bulb, replace the box and mark the outlet as out of service. Insert a new box in another outlet and do not use the broken one again. N.B. Never use an outlet when problems have occurred during the installation of the tap-off box, or when the tap-off box is replaced because out of service.

Thermal tests

Carry out a thermal test on the cover near the lock, using contact temperature sensors, optical pyrometers or thermal cameras. The test has to be carried out with tap-off boxes running at working current for at least 6 hours. Fill in the attached form together with ambient temperature and working current.

4.3 Filling the check form

4.3.1 Busduct record form for inspections and controls

PLANT	
CLIENT	
CONFIRMATION OF ORDER N.	
MANUFACTURING YEAR	
INSTALLATION YEAR	
INSTALLING COMPANY	

4.3.2 Inspections after installation

PERSON IN CHARGE OF INSPECTIONS	
COMPANY (if different from installing company)	
INSPECTION DATE	
SIGNATURE	

Element alignment	YES	NO

Junctions

Checked junctions (quantity)		
Total junctions (quantity)		
Correct installation	YES	NO
Soundness of insulating parts	YES	NO
Correct centring	YES	NO
Correct coupling clamp (85 Nm) - write value		

Connection to switchboard

Correct air distance between bars	
Correct coupling clamp	

Tests on electrical safety

Insulating resistance between L1 and neutral (L1-N)	
Insulating resistance between L2 and neutral (L2-N)	
Insulating resistance between L3 and neutral (L3-N)	
Insulating resistance between L1 and L2 (L1-L2)	
Insulating resistance between L2 and L3 (L2-L3)	
Insulating resistance between L3 and L1 (L3-L1)	
Insulating resistance between L1 and earth (L1-PE)	
Insulating resistance between L2 and earth (L2-PE)	
Insulating resistance between L3 and earth (L3-PE)	
Insulating resistance between neutral and earth (N-PE)	
Test voltage	

Note
N.B. Write the measured value of the insulating resistance

Thermal tests
Fill in the attached table, with reference to the inspected element. As per the measurement point and the plate present on the measurement side, fill in the relative box with the measured temperature value.

5. Verification

5.1 Definition of the check sequence

5.1.1 Busduct periodic inspections are to be carried out yearly

THERMAL TESTS

In order to performe inspections over installations, it is raccomanded to de-energise the busbar. After having path the plant at the maximal working current for at least 6 hours, carry out a thermal test, taking in particular consideration the points where labels had been sticked on during installation. Fill in the attached form with the measured values, together with ambient temperature and working current (form for thermal tests at pages 115-117). If the measured temperature (DT) is higher than 55 K or is 15 K higher than the temperature measured during installation, get in contact with Customer Care. This thermal test should be carried out with contact temperature sensors, optical pyrometers or thermal cameras.

JUNCTIONS

It is recomanded to open a random sample (10%) of the mechanical junctions, and for every junction verify that:

1 plastics are sound, in particular there are no slits, and plastic colour has not changed. If it is not the case, wholly replace the monobloc.
2 there are no water, scale-marks or foreign materials (dust, grime, etc.) on the protective flanges of the mechanical junctions. In case they are found, also verify the bars near the block. Dry possible wet parts with hot air at a temperature not higher than 80 °C and remove residues with mild reagents (e.g. trichloroethene) not corroding or creating abrasion on surface treatment (zinc, tin, silver coating) or on contact surface (copper).
3 blocks correctly adhere on bars (use a 0.05mm thickness gauge), i.e. conducting parts fully make contact.
4 the torque moment of the self-breaking bolts with a torque wrench calibrated at 85 Nm. During the measurement the line has to be at ambient temperature. If the torque moment is lower than the required value (85Nm), re-establish it.
5 insulation test at 1000V, with minimum value of 1MΩ, for every separated line stretch. The insulation test has to be carried out between phases, between phases and neutral, and between every single phase and the casing. If results are unsuccessful, identify the stretch and in case replace it or carry out further tests.

If insulation test is made to every piece the value minimal is 100MΩ.
In case the inspections carried out have negative results, extend the inspections on all junctions and get in contact with Customer Care.

5.1.2 Tap-off boxes annual periodic inspections

Carry out a thermal test on the cover near the lock, using contact temperature sensors, optical pyrometers or thermal cameras. The test has to be carried out with tap-off boxes running at working current for at least 6 hours. Fill in the attached form together with ambient temperature and working current. If the measured relative temperature (DT) is higher than 55 K or is 15 K higher than the temperature measured during installation, get in contact with Customer Care.

Verify if joining screws are correctly tightened.

5.1.3 Annual periodic inspections carried out one year after energizing and every other following year

PERSON IN CHARGE OF INSPECTIONS	
COMPANY (if different from installing company)	
INSPECTION DATE	
SIGNATURE	

Junctions

Checked junctions (quantity)		
Total junctions (quantity)		
Soundness of insulating parts	**YES**	**NO**
Absence of water, scale and dust in flanges	**YES**	**NO**
Correct centring	**YES**	**NO**
Correct coupling clamp (85 Nm) - write value		

Connection to switchboard

Correct air distance between bars	
Correct coupling clamp	
Tests on electrical safety	
Insulating resistance between L1 and neutral (L1-N)	
Insulating resistance between L2 and neutral (L2-N)	
Insulating resistance between L3 and neutral (L3-N)	
Insulating resistance between L1 and L2 (L1-L2)	
Insulating resistance between L2 and L3 (L2-L3)	
Insulating resistance between L3 and L1 (L3-L1)	
Insulating resistance between L1 and earth (L1-PE)	
Insulating resistance between L2 and earth (L2-PE)	
Insulating resistance between L3 and earth (L3-PE)	
Insulating resistance between neutral and earth (N-PE)	

Note
N.B. Write the measured value of the insulating resistance

Thermal tests
Fill in the attached table, with reference to the inspected element.
As per the measurement point and the plate present on the meausurement side, fill in the relative box with the measured temperature value.

5. Verification

5.1.4 Inspections after installation and yearly

PERSON IN CHARGE OF INSPECTIONS	
COMPANY (if different from installing company)	
INSPECTION DATE	
SIGNATURE	

Correct coupling clamp of connecting screws

Thermal tests

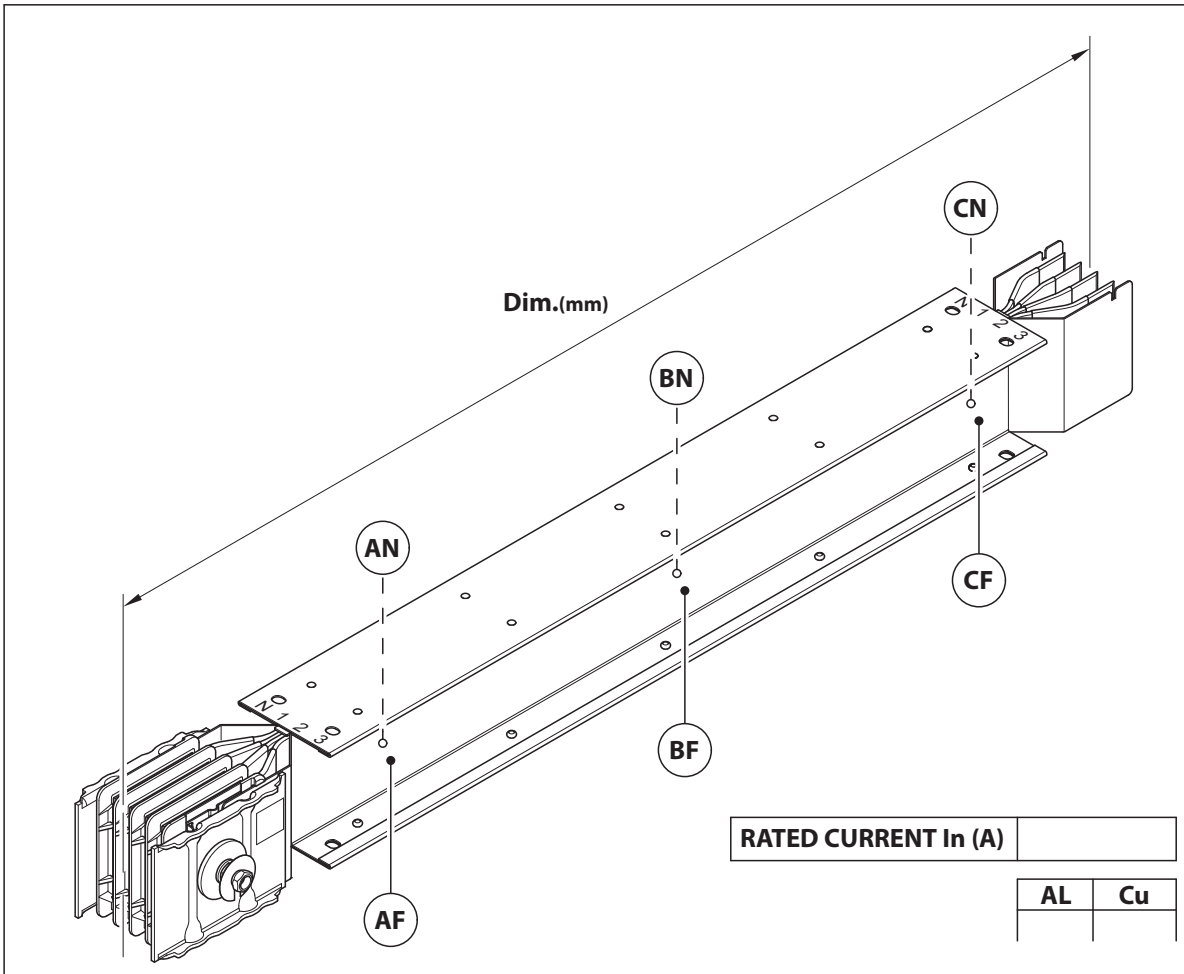
Tap-off box n.	**Measured T**	Ambient T	Dt	Ib
Tap-off box n.	**Measured T**	Ambient T	Dt	Ib
Tap-off box n.	**Measured T**	Ambient T	Dt	Ib
Tap-off box n.	**Measured T**	Ambient T	Dt	Ib
Tap-off box n.	**Measured T**	Ambient T	Dt	Ib
Tap-off box n.	**Measured T**	Ambient T	Dt	Ib
Tap-off box n.	**Measured T**	Ambient T	Dt	Ib
Tap-off box n.	**Measured T**	Ambient T	Dt	Ib
Tap-off box n.	**Measured T**	Ambient T	Dt	Ib
Tap-off box n.	**Measured T**	Ambient T	Dt	Ib
Tap-off box n.	**Measured T**	Ambient T	Dt	Ib
Tap-off box n.	**Measured T**	Ambient T	Dt	Ib

Dt = Tmeasured - Tambient
Ib = working current

5.1.5 Feeder element

ELEMENT IDENTIFICATION	
PERSON IN CHARGE OF INSPECTIONS	
COMPANY (if different from installing company)	
INSPECTION DATE	
SIGNATURE	

N.B. Stick on the element a label with a progressive number for identification.



RATED CURRENT In (A)	

AL	**Cu**

POS.	**Dim.(mm)**	**AF**	**BF**	**CF**	**AN**	**BN**	**CN**	**Ta (°C)**	**I. (A)**

5. Verification

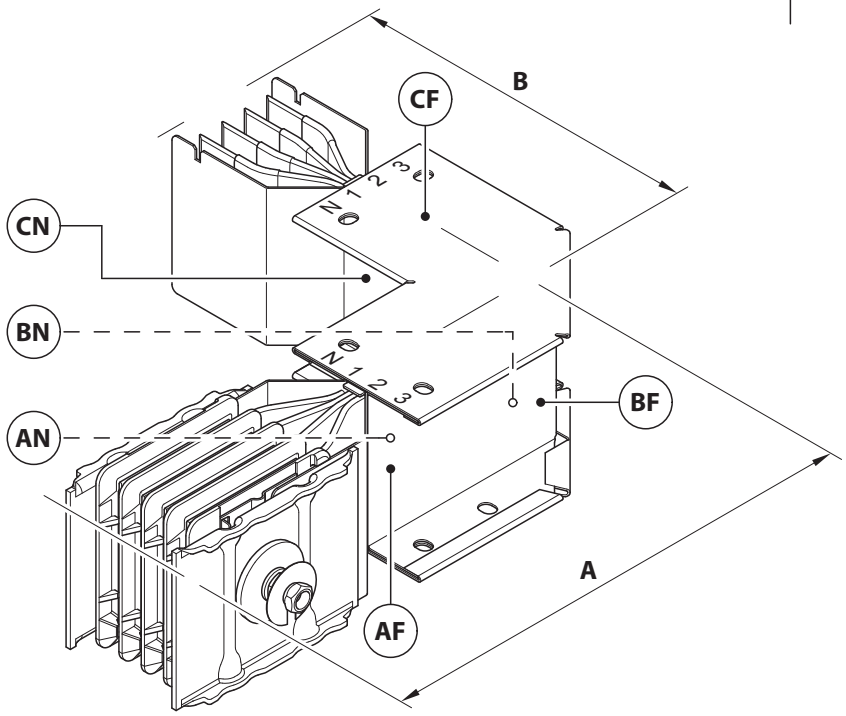
5.1.6 Dihedral elbow

ELEMENT IDENTIFICATION	
PERSON IN CHARGE OF INSPECTIONS	
COMPANY (if different from installing company)	
INSPECTION DATE	
SIGNATURE	

N.B. Stick on the element a label with a progressive number for identification.

RATED CURRENT In (A)	

AL	**Cu**



POS.	Dim.(mm) A	Dim.(mm) B	AF	BF	CF	AN	BN	CN	Ta (°C)	I. (A)

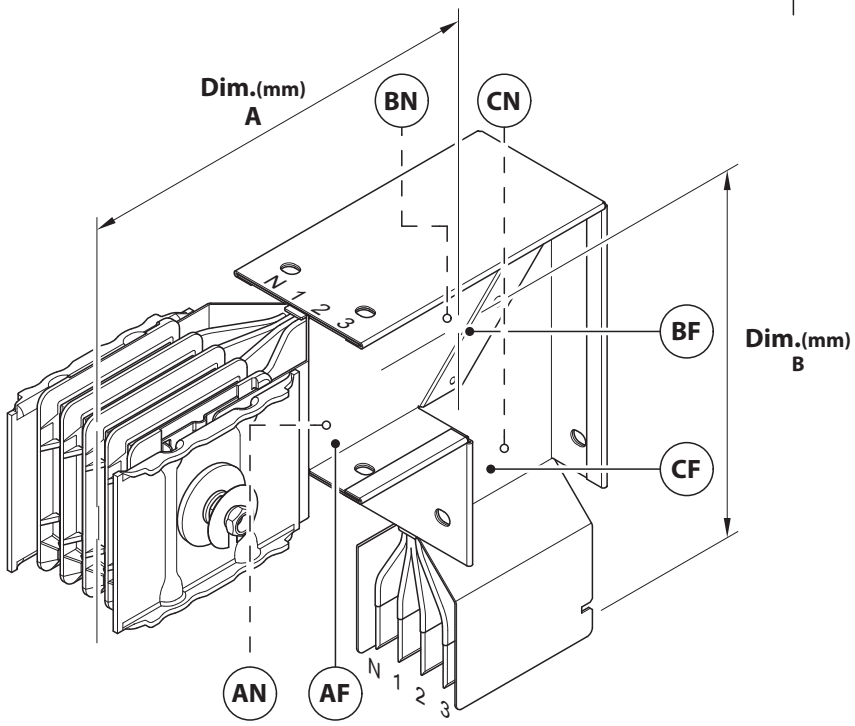
5.1.7 Flat elbow

ELEMENT IDENTIFICATION	
PERSON IN CHARGE OF INSPECTIONS	
COMPANY (if different from installing company)	
INSPECTION DATE	
SIGNATURE	

N.B. Stick on the element a label with a progressive number for identification.

RATED CURRENT In (A)	

AL	**Cu**



POS.	Dim.(mm) A	Dim.(mm) B	AF	BF	CF	AN	BN	CN	Ta (°C)	I. (A)

5. Verification

5.1.8 Troubleshooting table

Problem's signals	Where?	Causes:	Solutions:	
			Materials are damaged:	Materials are ok:
Abnormal heat on:	Monoblock or along busbar plant or elbow	Couple loosing Nut not broken	Request spare parts	Strength the torque
		Wrong mounting Monoblock tooth wrong		Change way to mounting
Burnished point on:	casing or insulating	broken insulating overload on the line	request spare parts	
Low insulating measure	apply "half plant" technique, to find out:	mechanical damage water inside broken insulating	request spare parts	
Mccb break on panel board, on feed unit, on TOB:	apply "half plant" technique, to find out:	- electrical overload - bad electrical contact - short circuit on load - short circuit inside TOB - broken MCCB - wrong mounting MCCB - too much hot environment - water inside	request spare parts	

6. Disposal

For the identification of the materials and the disposal instructions visit www.bticino.com/disposal.

XCP High Power Busbar

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NORTH AMERICAN HEADQUARTERS
168 Georgetown Road | Canonsburg, PA 15317 | USA | +1 800-245-6378

UK & NORTHERN EUROPE
Unit C Island Road | Reading RG2 0RP | UK | +44 (0) 1183-043180

ASIA PACIFIC REGION
16D Tuas Avenue 1 | #04-60/62 | JTC Space @ Tuas | Singapore 639536 | +65 6950-1247

StarlinePower.com
+1 724-597-7800 | +1 800-245-6378

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