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# General Introduction

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All Naxso busbars can bear overloads for little lapses of time. As already know by researches and studies on this topic the overloads are triggered by many external factors like:

- extra currents
- extensive lamps/appliances installations ( in this case run a calculation to prevent that the sum of all the extra loads overcomes more than 20% the nominal rating)
- heavy machinery engines
- electrical gears asking for severe extra currents

It often happens and we constantly witness it during our installations that electronic parts are added to the network. When UPS devices, emergency lights, emergency power suppliers, transistors, computers or similar equipments are installed this results into HARMONICS.

In case of harmonics the real power absorbed is higher than the nominal and even the frequency 50/60 Hz can be higher than the apparent one with damages and faults. There is a norm stating the

limit of harmonics in a network called EN 61000-3-4 and EN 61000-3-12

In addition when a tap off is connected to a busway the right position is head-on and the tap off doesn't weigh improperly on the length. The connecting cables as well don't have to weigh on the tap off body but need to be fixed with proper brackets/strips to the busbar and possibly next-door to a supporting bracket.

BEFORE GIVING TENSION TO A LINE RUN A GENERAL INSULATION TEST AND COMPARE WITH A MHOMM VALUE AS STATED BY THE NORMS

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# Lighting trunking

## Instructions and suggestions

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For a safe and sound installation of the lighting busways unload and carry the products inside to an area where they are not exposed to dust or inclement weather. Do not store them outdoors.

Unpack and layout on the floor the trunking components required to mount the line.

Check the right correspondance of the product to the ordered busbar trunking to be sure that the amperage rating and product part number is the one ordered and designed by the consultant/customer/installation company/...

Perform all these operation into a clean and dry area.

Install the fixing brackets after having chosen them from the Naxso catalogue or ask a Naxso expert a suggestion on the matter.

Assemble two or three lengths (clip them together) and lock them with the joint screw. Position the line segment in the fixing brackets. They designed to relieve the installer of the weight. The following segments will be mounted effortlessly, due to the ease of assembling the mechanical and electrical connections.

Adjusting the level of the line is one important issue as the straight installation waveless and strongly fixed is one must of the assembly and erection.

Connection of the tap-off units to the luminaires, phase selection and mounting of the fixings are carried out on the ground. These operations can also be carried out in the workshop, before delivery to the site.

When mounting the luminaires on the trunking please make sure that the luminaire is held in place as soon as the bracket is placed on the trunking.

**NEVER DISMANTLE THE JOINT. NEVER CUT THE BUSBAR.  
YOU LOSE THE WARRANTY!**



Connect the tap-off unit to the trunking, check the insulation and circuits before energising the line.

Energise the system.

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# Power trunking

## Instructions and suggestions

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For a safe and sound installation of the lighting busways unload and carry the products inside to an area where they are not exposed to dust or inclement weather. Do not store them outdoors.

Unpack and layout on the floor the trunking components required to mount the line.

Check the right correspondance of the product to the ordered busbar trunking to be sure that the amperage rating and product part number is the one ordered and designed by the consultant/customer/installation company/...

Install the fixing brackets after having chosen them from the Naxso catalogue or after having asked a Naxso expert for a suggestion. Please consider that the position of the trunking can be windows face on top as suggested in the general installation leaflet edited by Naxso .

Pay extra care when calculating the number of brackets to be installed when there are plenty of metal tap-offs. Other factors influence the number of brackets like big vibrations from cranes, punching machines or wind coming from big doorways opened and closed at a high frequency.

Assemble the lengths on the floor checking the joint torque if required.

Position the line segment in the fixing brackets. They designed to relieve the installer of the weight.

Adjusting the level of the line is one important issue as the straight installation waveless and strongly fixed is one must of the assembly and erection.

Connect the tap-off units to the trunking and connect incoming cables and if the cable is armoured or heavy or stiff (aluminium cables) the fixing bracket is next door to this fixing point. Unproper assembly of the cable will result into sever twist of the tap-off contacts or a twist of a busbar itself.

When installation comes to the end please check the length of the line and control the theoretical tension drop of the line if the installation is exceeding and overcoming 70-80 meters.

Check the insulation and circuits before energizing the line.

Energise the system to check operation loading the first time step by step the tap-offs installed turning on one by one the different machinery . Make sure the right tap-off is connected to the right machinery and tap-off rating and protection (fuse or circuit breaker) is the needed one.

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# Sandwich busways

Instructions and suggestions

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Please follow the upcoming sections of the Naxso Busbar Manual and Quality Control Assurance program on this manual.



Naxso Srl

# ***Naxso Busbar Manual***

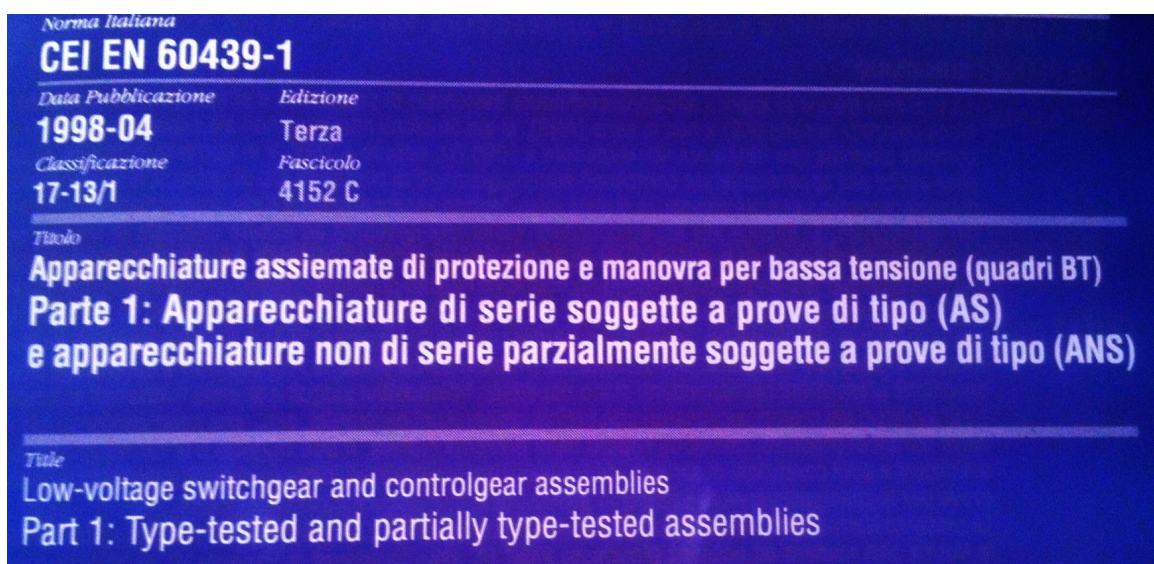


# Installation and to do's

## Introduction

All Naxso products are tested according to EN/IEC 60439 2 norm.

To get the best out of Naxso products all the busbars shall remain in perfect condition during the delivery including transport, unpacking, on-site local



storage and installation.

All Naxso busbars are wrapped up and secured safely.

These products are bulky and may cause danger to people and even risk of death when improperly handled.



All long packages weighting more than 20kgs need to be operated with proper lifts, forklifts and/or any similar equipments aimed to prevent the people involved and the products to be seriously harmed. To achieve this the personell must wear all necessary protections like gloves, protective footwear and all other safety units in accordance to local security and health regulations.



In case of damage occured during transport the goods need immediate inspection and even if a small part looks suspicious refer to Naxso maintenance service before performing the installation.

If the busbar isn't installed immediately after delivery it must be stored in a heated, clean, dry area. Besides the most detrimental storage conditions are when goods are exposed to:

- Rain
- Wind
- Humidity
- Frost
- All kind of outdoor weather conditions

So never place the unloaded materials outdoor even if they come with an IP55 protection as the protection is applied only at the very moment of installation and not before. Ignoring this advice will expose the product to damages on both insulation and plastic parts.



The Naxso busbar operate at 400V so before and after installation, start working to ensure complete electrical insulation. This check has to be run before carrying out any operation and maintenance service and in accordance with insulation procedures.

## NO TAMPERING

**Every kind of tampering is strictly forbidden no matter if the modification of the product has been conceived and carried out to sort out problems or to adapt the product to new needs.**

**NO MATTER IF THE MANUMISSION IS VERY LITTLE AND APPARENTLY NOT INVASIVE**

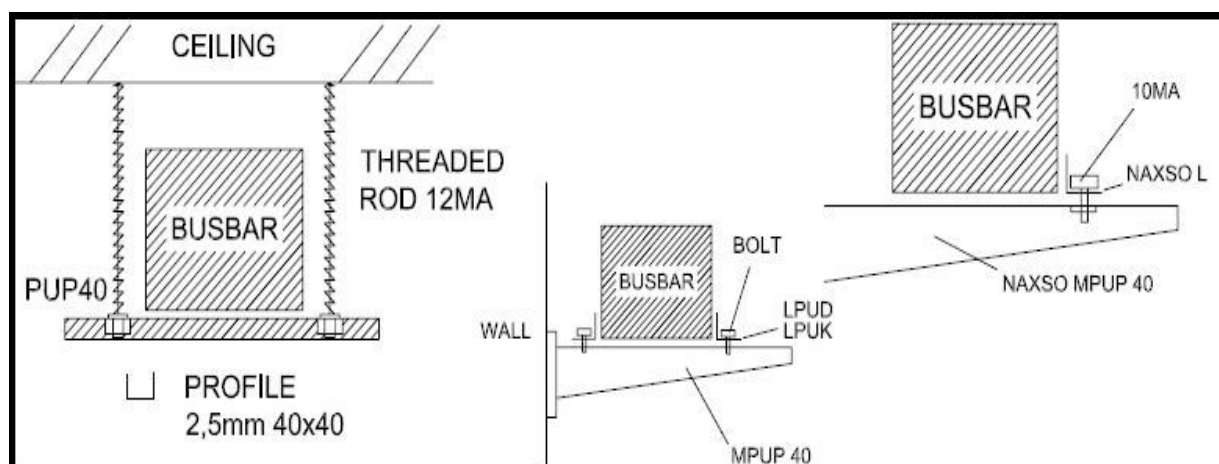
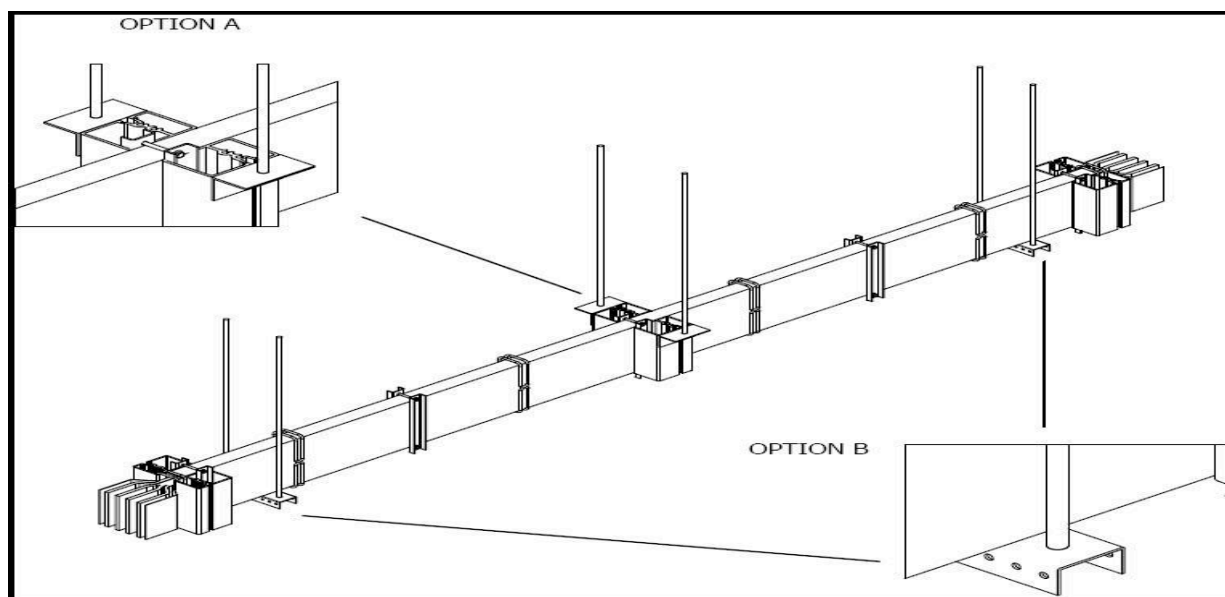
**NO MATTER IF THE MODIFICATION IS NOT ENGAGING MAIN PARTS EVEN A SINGLE LITTLE BOLT SHALL NOT MODIFIED**

**ALL THE TAMPERINGS WILL HAVE THE IMMEDIATE RESULT TO HAULT COMPLETELY THE WARRANTY ON THE PRODUCT**

**NAXSO WILL REJECT IMMEDIATELY ALL THE PROBLEMS ARISING AFTER A MANUMISSION OR MODIFICATION OF THE PRODUCT AND WON'T BE RESPONSIBLE INTERNATIONALLY FOR ANY DAMAGES ON SITES OR PEOPLE.**

## Straight parts installation

Before unloading and starting the straight parts installation, the personell shall check that all the run is clean and any humidity and/or rain and liquid parts laying are removed and the area is dry. All the needed brackets shall be in position and strongly fixed and checked.



Before lifting the busbars ensure that the lifting procedures can be performed in the area and no barriers are in the path. Fixing brackets have to be placed according to the following minimum requirements:

- STRAIGHT BUSBARS 3 MTS --> minimum 2 brackets
- STRAIGHT BUSBARS LESS THAN 2 MTS --> minimum 2 brackets
- STRAIGHT BUSBARS LESS THAN 1 MT --> minimum 1 bracket

- ALL ELBOWS, TERMINALS AND SPECIAL PARTS --> minimum 1 bracket

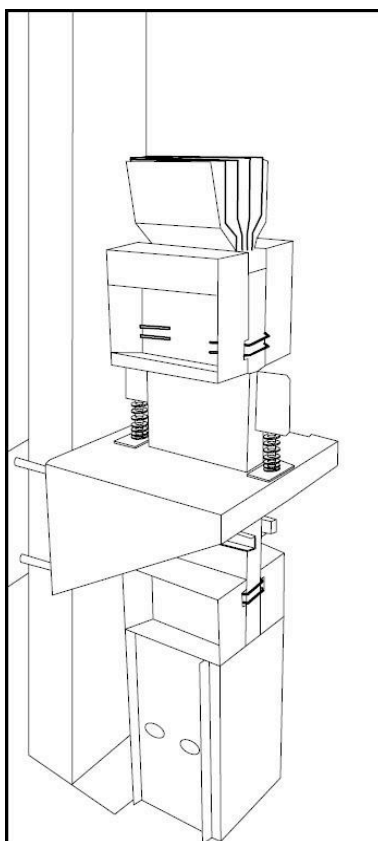
Level and plum all the parts before performing and tightening the joints. Don't dismantle any part to let better laying of straights or elbows as they are supplied in the right assembly pre-installation status.

All these warnings are referred to both vertical and horizontal installations. If any vertical installation shall be made please add the following additional remarks.

## VERTICAL INSTALLATION

Put a lot of effort when rising from horizontal to vertical position taking care to prevent the terminal parts of the busbar from hurting any concrete or similar parts in vertical area.

The lift shall have a power higher by 100% of the weight of the single straight element to be risen up.



The assembly of two or more parts before the installation is strictly forbidden no matter if the area of installation is uncomfortable and the way to be filled with

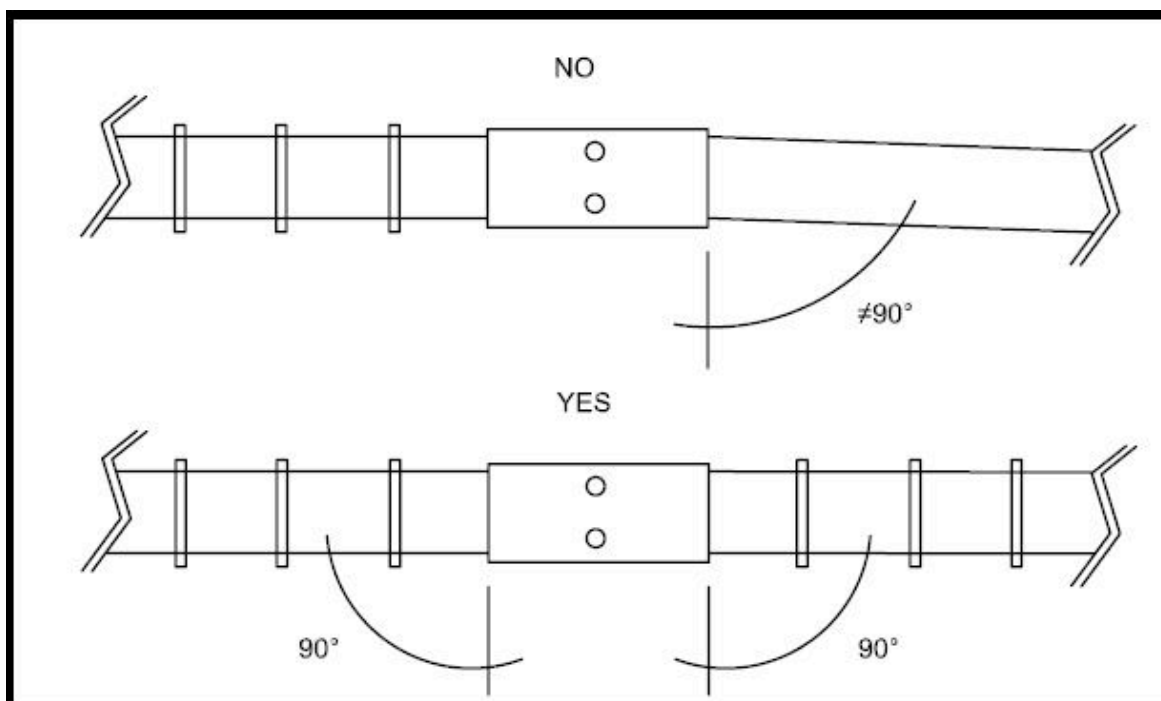
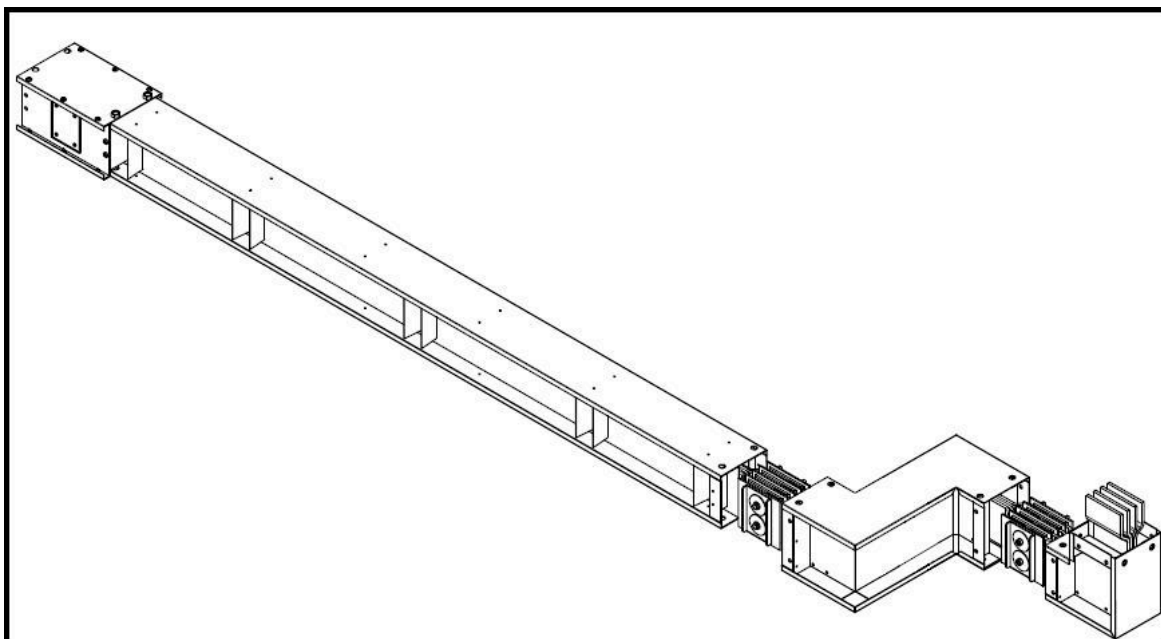
busbars is hard. Avoid to assemble a straight and an elbow or an elbow and a knee or even just two straight parts before installing as you could seriously affect the joint and the assembly parts.

To ensure the right bracketing the vertical installations need Naxso vertical brackets. Special attention must be paid to the first bottom straight element where two brackets are applied to ensure the vertical installation in a strong way regardless the first element is long or short.

Before powering the line proceed with a precise check of torque of every joint so that after the installation time elapsed, the first joints have not been subsequently loosened. Check once again the straight way with alignment instruments and plumbing.

Perform an insulation resistance test at 1000V between each conductor and the earth. The phase check sequence needs to be correct in trafo connection, cabinet terminal and in any of each tap off boxes and feed units.





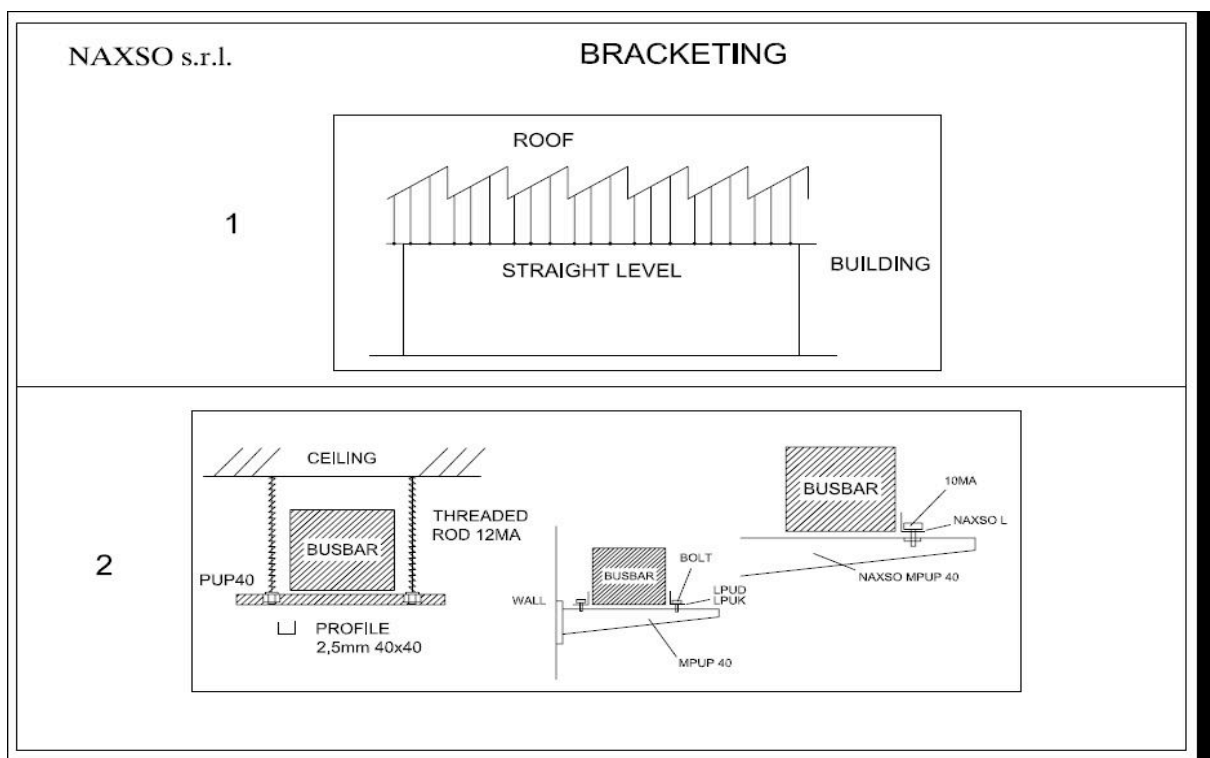




# Sandwich Installation Guidelines

## **OPERATIONS RANKING**

- BRACKETING
- PLAN LEVEL INSTALLATION
- ARRANGEMENT IN A STRAIGHT/VERTICAL LINE
- PERIODICAL CONTROLS
- STRICTLY FORBIDDEN OPERATIONS

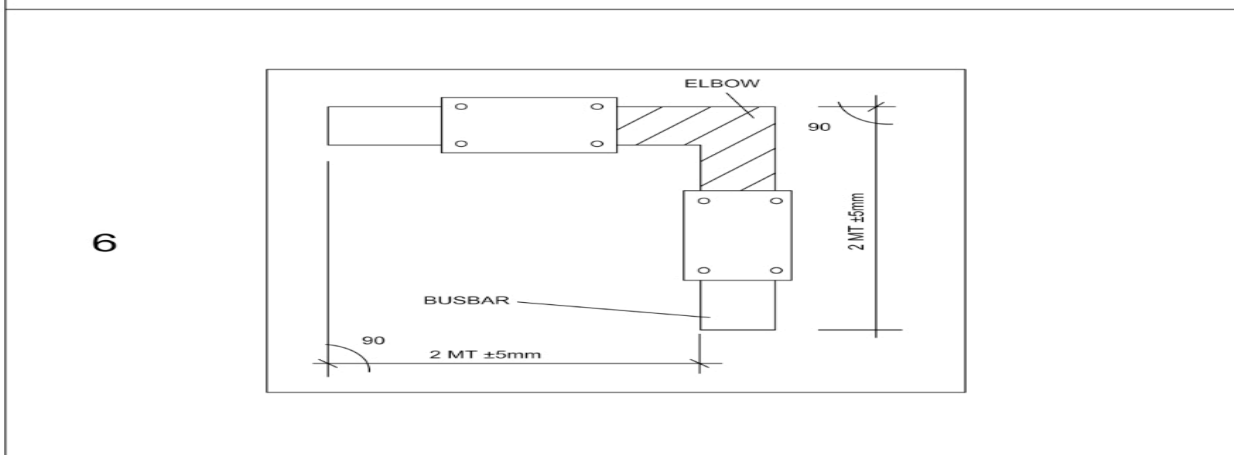
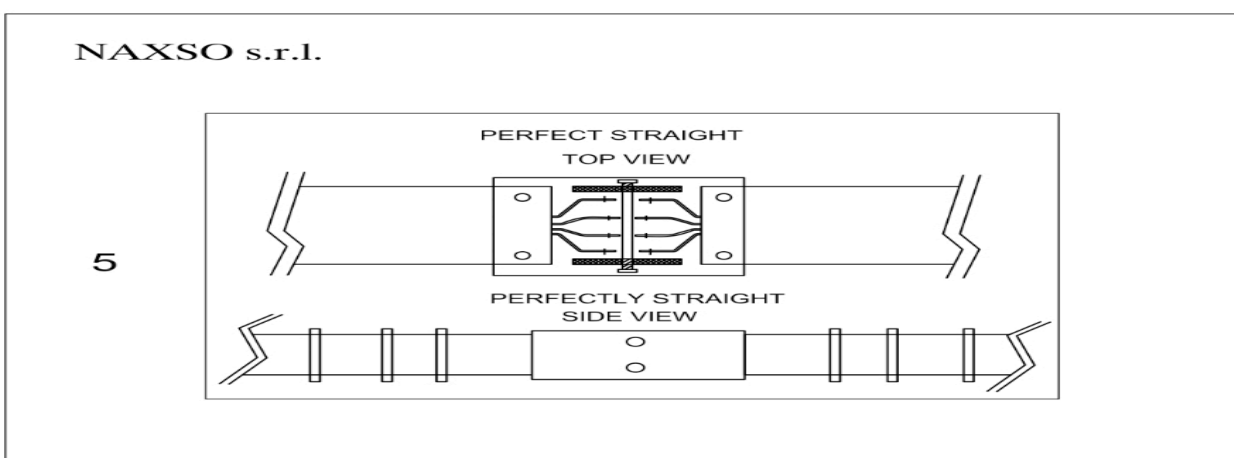
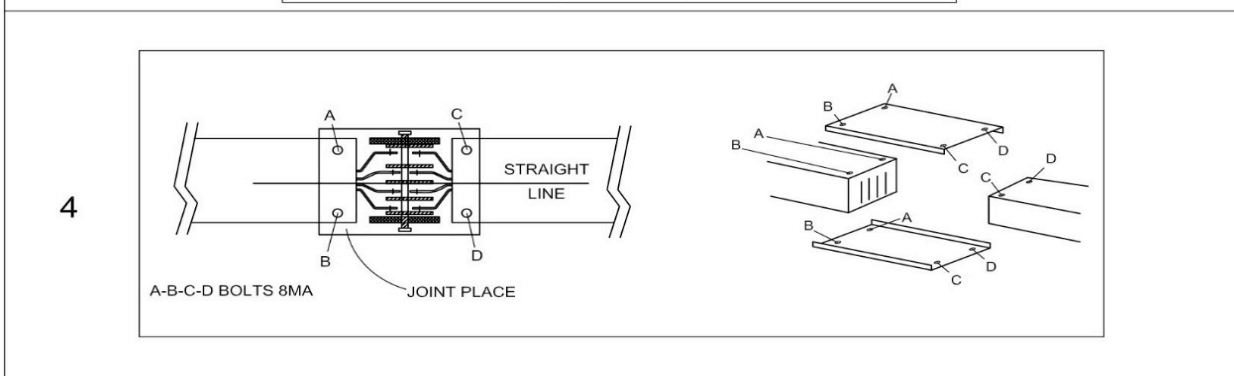
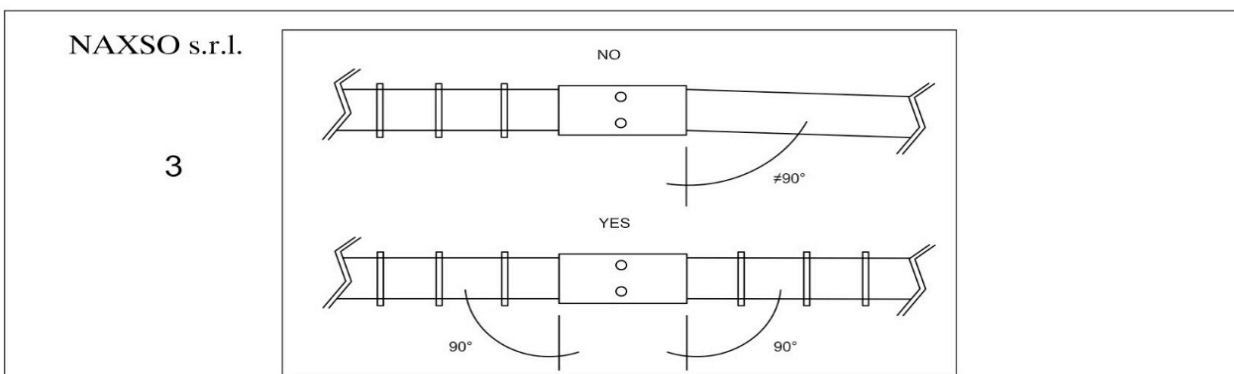


## BRACKETING

It's the first and main work that anticipates any installation and implies a path that needs to be identified in order to lay the busbar in the right position both vertical and flat.

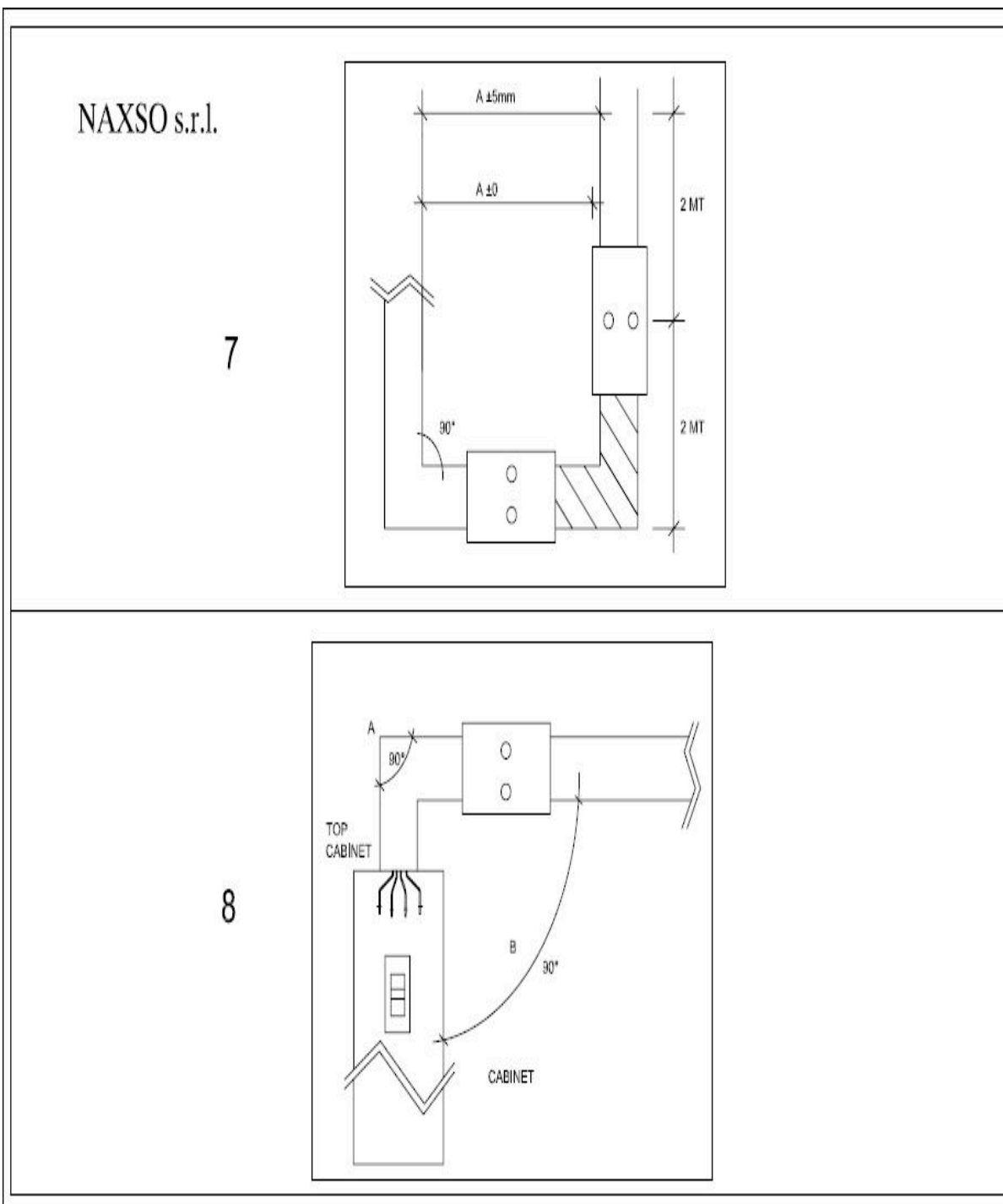
The brackets have to be positioned well in advance as the stable position is reached after a period of “settlement” of all supports and spit-rocks that shall be minimum 10MA or higher.

A standard way to fix busbars is to place rod threads minimum 10MA and lay the busbar tightly on a pre-holed 10MA bolts-to-14MA U profile like Naxso



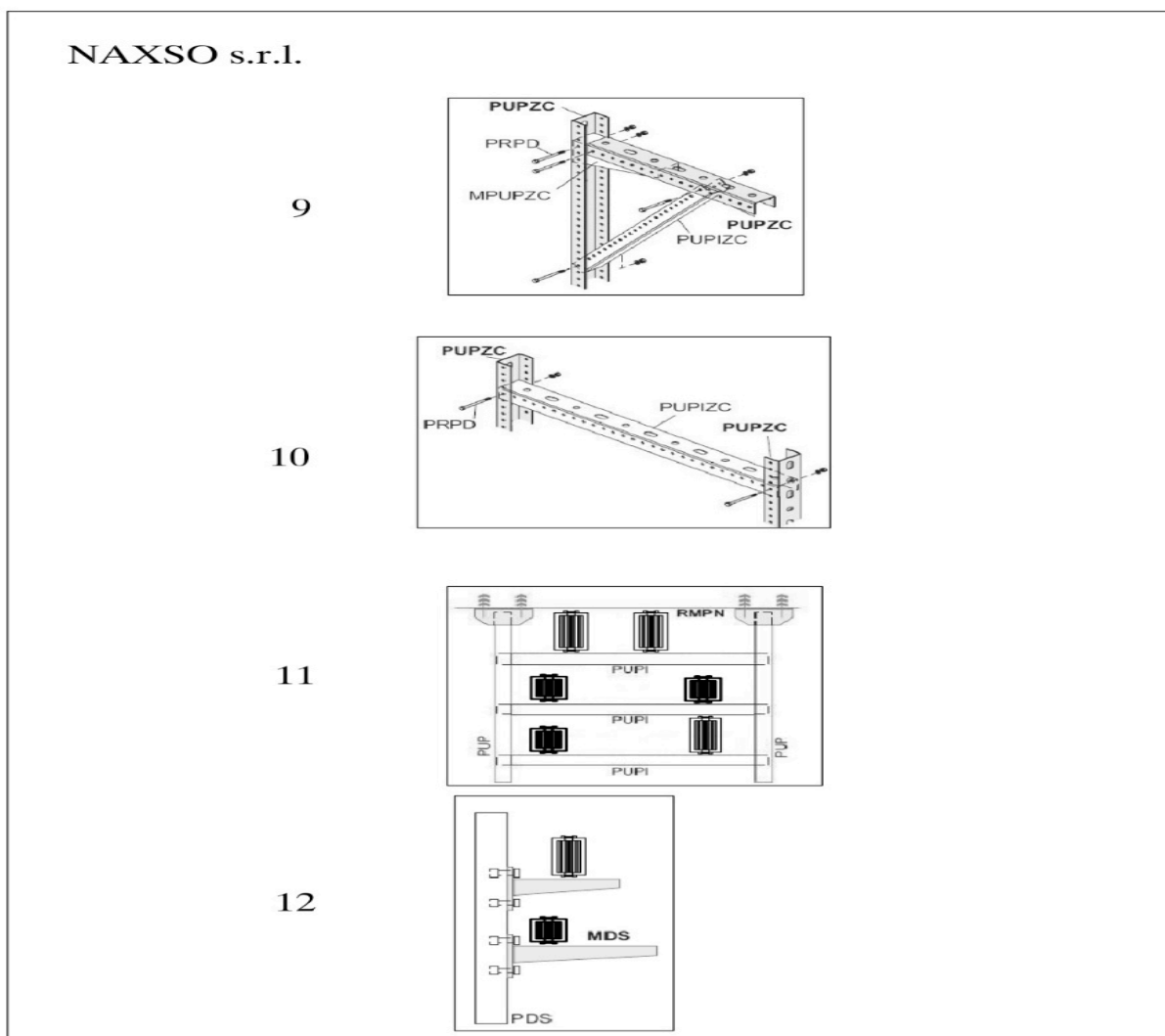
PUP04 or PUP05.

An additional way is to place the busbars on a wall is to install a wall bracket like



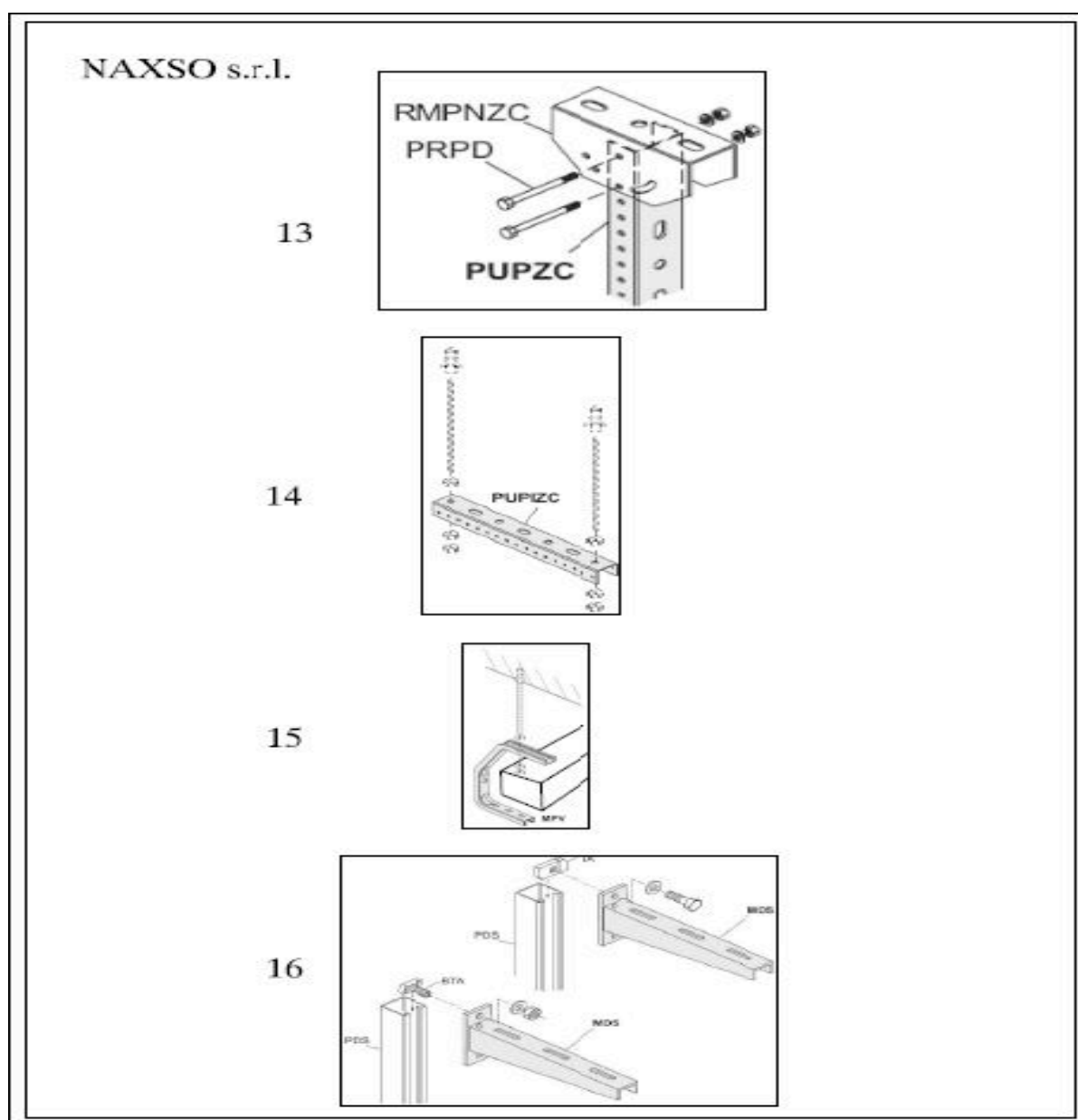
Naxso MPUP and lay the busbar in a stable position thanks to L fixing points like Naxso LPU.

The way to install and erect busbars starts from a perfect bracketing installation straight, strong and with perfect horizontal and vertical levels. Only after testing the levels, state and minimum tolerance the busbar installation can start.



## PLAN LEVEL INSTALLATION and ARRANGEMENTS

Installation levels have to be stated into an horizontal and vertical way by instruments like a laser meter or any other precision device because the accuracy needs to be extremely high requiring the same level as per bracketing.



To be sure that the good work made on brackets is useful a strong latching of the busbar to the bracket needs to be assured via all kinds of L and U fixings. As per attached drawings.

The busbar need to be not only perfectly aligned but even stable and strongly connected to the brackets in order to prevent any movement due to dilations or vibrations or any other possible events (for ex: wind due to main doors opening/closing in a plant; lifts going up and down carrying weights and causing micro-shocks and strong floor vibrations...) and so on.

If any constant and not occasional stress occurs into a building we do recommend a number of anti-vibration items like rubber or special springs. In case of vertical lines two kinds of brackets shall be installed.

### **Bracket 1**

To ensure the right distance and layer from the wall and to get a perfect vertical alignment of the busbars this bracket has to be fixed at every single lenght around every 3 meters and before and after a floor if that point is fitted with fire-barrier (see drawing).

### **Bracket 2**

To ensure stability to the vertical development, to fix strongly the busbar to the vertical line and to be able to weight all the busbar line letting little vertical dilations, this kind of bracket needs to be placed every two or three lenghts and is usually provided by special strong springs to let a few millimeters up and down without compromising the strenght of the fixing busbar to the wall.

In case of fire barrier the brackets shall never be connected to the fire barrier structure and shall be at distance by at least 500mm from the point where the fire barrier begins.

## PERIODICAL CONTROLS

A number of controls shall be planned every period depending on the electrical and structural levels of charged stress on the busbars line.

Local temperature, including night and day shifts, summer-winter one, can affect the stress of the line as well as the rhythm of max load and unload charges. That's why a continuous and stable charge ensures a more stable temperature level than a kind of use of busbars as per continuous loads.

Temperature ups and downs together with all the different mentioned stresses result into more intensive period for maintenance checks. All the same an

average one year survey is strongly advised at the very beginning for the first few years and after this periodical checks if everything is stable. The maintenance can be put off but never cancelled.

The first installation usually takes place in a supposed perfect surface and only the alignment has to be checked even after some weeks from the installation and after the initial electrical charge of the line a complete re-check of the joint bolts has to be run.

If the bolts have more than 10% torque loss (around 5 to 10 newton/meter) second maintenance check shall be planned after another few weeks even if the second check might involve a reduced number of joints (one out of five, ten, every change of direction, or let's say one every elbow or terminal).

Please note that installations next to pipes or tubes or any other kind of heating so that hot water pipes or hot steam pipes or any kind of building heater shall



take place at a distance from the busbars as two or three times the dimension of the busbar.

## **STRICTLY FORBIDDEN**

- Never erect more than one part at every step or preassemble part of the line
- Never install busbars so that it is impossible to access all the joints bolts and all the covers
- Never install terminals or feeder boxes without single proper brackets
- Never run maintenance and give power with no revision and tests of the system
- Never lay cables in feeder boxes to weight on the box itself

## **RECAP**

All the single parts of the system shall be assembled one by one in sequence and no parts shall be pre-assembled separately like two elbows or one straight and an elbow or similar to prevent that during the erection a joint or many can suffer the improper erection or installation mechanical stress.

To install more than one single element at a time can cause sever mechanical stresses. Even to adapt some parts or some entire parts of the line to the brackets or to try to make the line parallel to walls or ceilings. Forcing the alignment is a sure way to damage some joints or weak parts of the system (like elbows or terminals) as the perfect alignment of the parts shall be natural and stress-free.

But after an installation the first control is the angles lying at 90° against the straight lenghts and the lines perfectly parallel to the walls or to the ceilings.

If a line is feeded by a feeder box, the box itself must be fixed to stable and extra strong brackets as the box weight and the cables must never weight or be supported by the first part of the connected busbar line. An extra attention must be observed connecting the cables into the box and torquing the final bolts.

Even removing the feeder cables for any maintenance operation, requires exactly the same attention and care. After disconnecting the feeder cables and reconnecting again before turning on the power a new check to the alignment and correct lay of the first parts of the line must be performed.

Same list of dangerous operations must be taken into account when connecting a terminal to the cabinet.

Any stiff connection between transformers terminals and line terminals have to be avoided to prevent all the vibrations of the trafo to be transferred to the

busbar line. All the joints after the assembly must be accessible by the four sides and have to be inspectionable.

## HARMONICS

In the modern plants a new phenomenon is taking place recently in a huge number of electrical plants installations. Its name is “**harmonic** waves” in the network generated mostly by all the pheripheral electronic controls and management.

All the ups, tristors, power inverters connected as final users to the electrical network have very high chances to introduce dangerous harmonics.

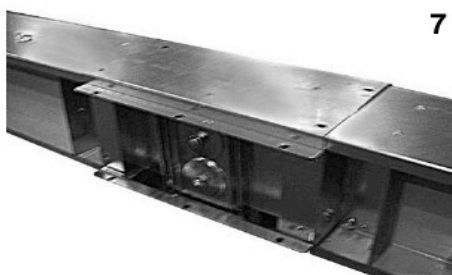
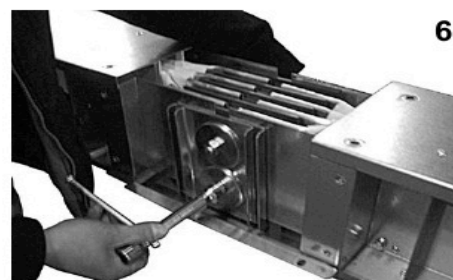
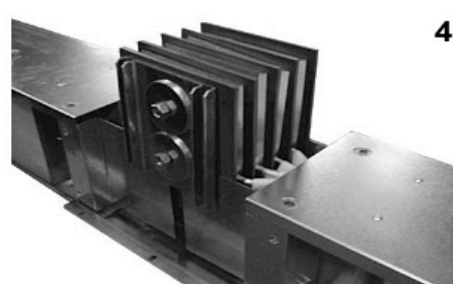
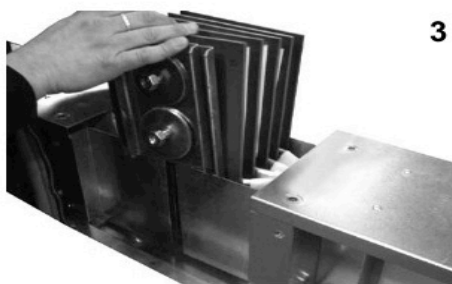
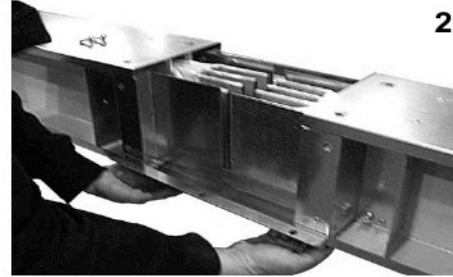
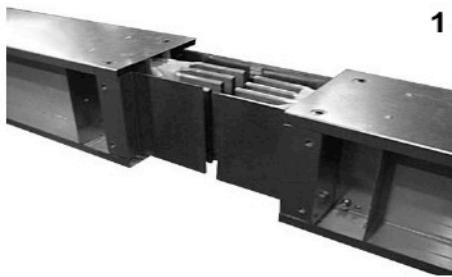
Odd harmonics resulting into massive power consumption for short periods but repeatedly in the circuits. So if the main circuit breaker is correctly dimensioned

for minutes, high current even double or three times the value can flow in the network and for such a short time the circuit breakers are not sensitive enough to protect but the busbars can suffer serious damage and have great stress because this is repeated even hundred times a day in addition not only the power is stressed but often even the frequency so that is not so unusual to have 60, 70 hertz in the circuit with severe danger for all the connected appliances.

All these bad currents in the network can be spotted and unveiled with a special recorder meter machinery. Naxso has a department made of experts that master the subject and can check the circuits networks and list each of the problems arising.

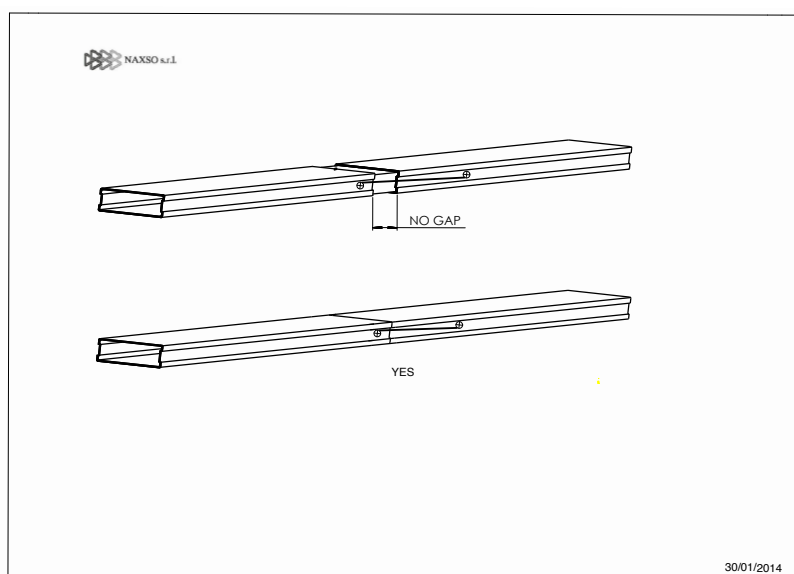
So please don't hesitate to contact us regarding harmonics involving ups, signal generators, inverters, emergency lamps, emergency circuit protectors for computers, motor encoder controllers, electronic switches, motor electronic regulators and numeric controlled machinery.

**SANDWICH ASSEMBLY INSTRUCTIONS - STRUZIONI DI MONTAGGIO SANDWICH**



# Maintenance instructions for Lighting Range

All the lighting busways are small, compact and obtained through a strong and stiff aluminium extrusion. They have to be meticulously aligned to ensure a stable and durable joint connection. The bars have a tolerance in the joint connection of 3-4 mms. This means that in case of non-perfect connection the joint will suffer. Be sure that the connection is perfect. Have a look at the drawing of the side springs with the two working screws.



The lighting lengths shall never be installed flatwise (45mm side face floor) unless a double number of brackets is applied but consider the side 17mm face floor as standard installation. When installing a line be sure the joint screws are face down and screwed and

secured with the connection little spring. All the tap offs connected to a busbar must be installed with the security spring on the side jaws. These metal clips are not accessories but part of the product. If not installed the tap off loses the warranty and harms the full system due to its expansions, vibrations,...

# Maintenance instructions for BP/BPK/BPG range

All the Naxsopower range from Bp to BPG requires NO maintenance procedures with the exception of high thermal trip.

Thermal trips can be temporary or triggered by local conditions like weather, machinery or overcurrent exposures. In both cases some parts like the joints can be affected and so an inspection is highly recommended after every temperature-trip cycle.

This inspection consists into an internal control basically. The inspector shall walk through some suggested steps:

- the current must be switched-off
- the joint needs to be opened
- the conductors surface will be then meticulously examined in order to spot any potential damages and black traces (overheating)
- the same routine has to be performed with a tap off and its contacts examined like the conductors

BP/BPK/BPG are meant for tap offs and their maintenance consists of:

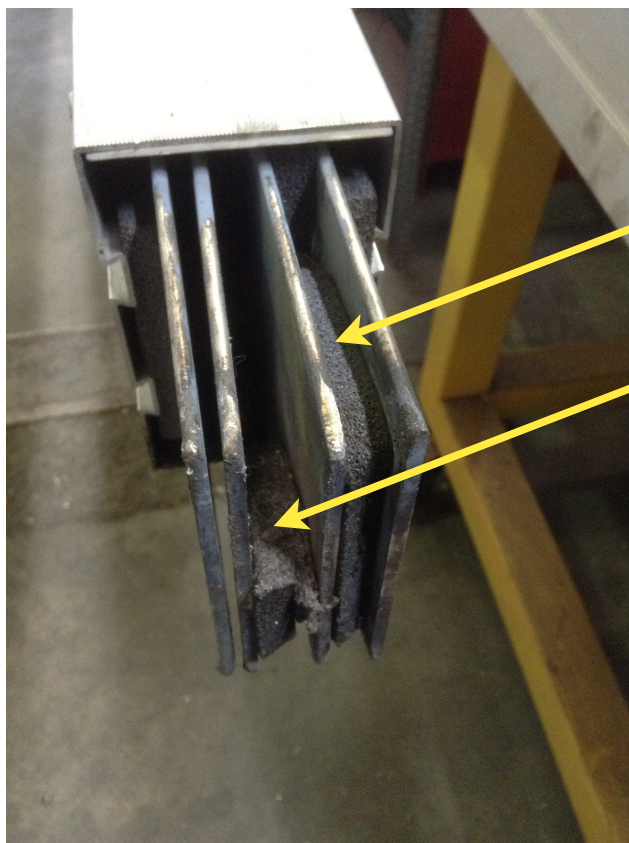
- monitoring the increase in number of installed tap offs
- checking if the total charge rating is compatible with the general rating of busbars after the increased number of tap offs

This means that initially the designer/consultant have calculated the starting tap off number... After a time new more tap offs have been installed... So every month a final calculation is welcomed to confirm that the total tap offs are compatible according to the busbars rating.

All the lenghts come with insulating separators on the side of the contacts.

PLEASE **REMOVE THEM** WHEN INSTALLING THE BUSWAYS TOGETHER.

Not removing these items will result into severe damages and will harm all the system functioning. See the picture below.

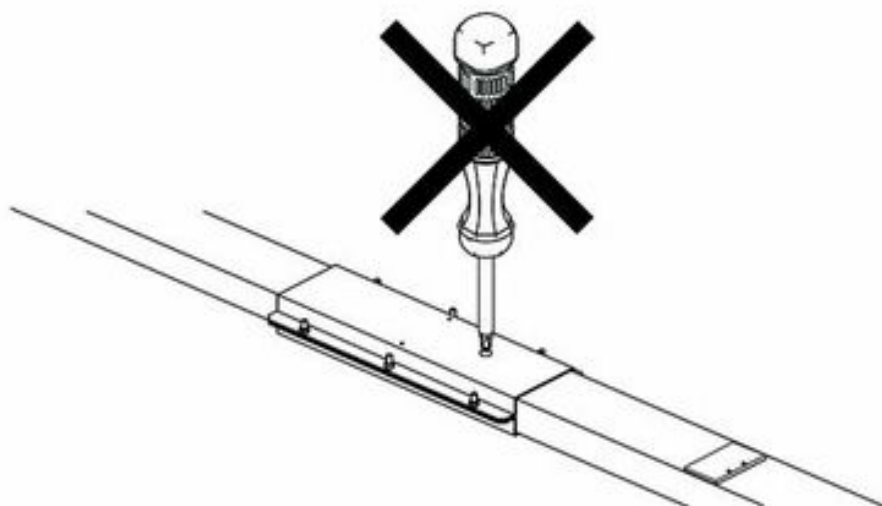


EX: the operator did not remove the insulation covers among the contacts... He joined the bars and turned on the current. As a result all fhe line witnessed a blast and the warranty on the product lost its validity.

**YOU NEED TO REMOVE THESE INSULATING SEPARATORS WHEN INSTALLING**

**BP SERIES:**

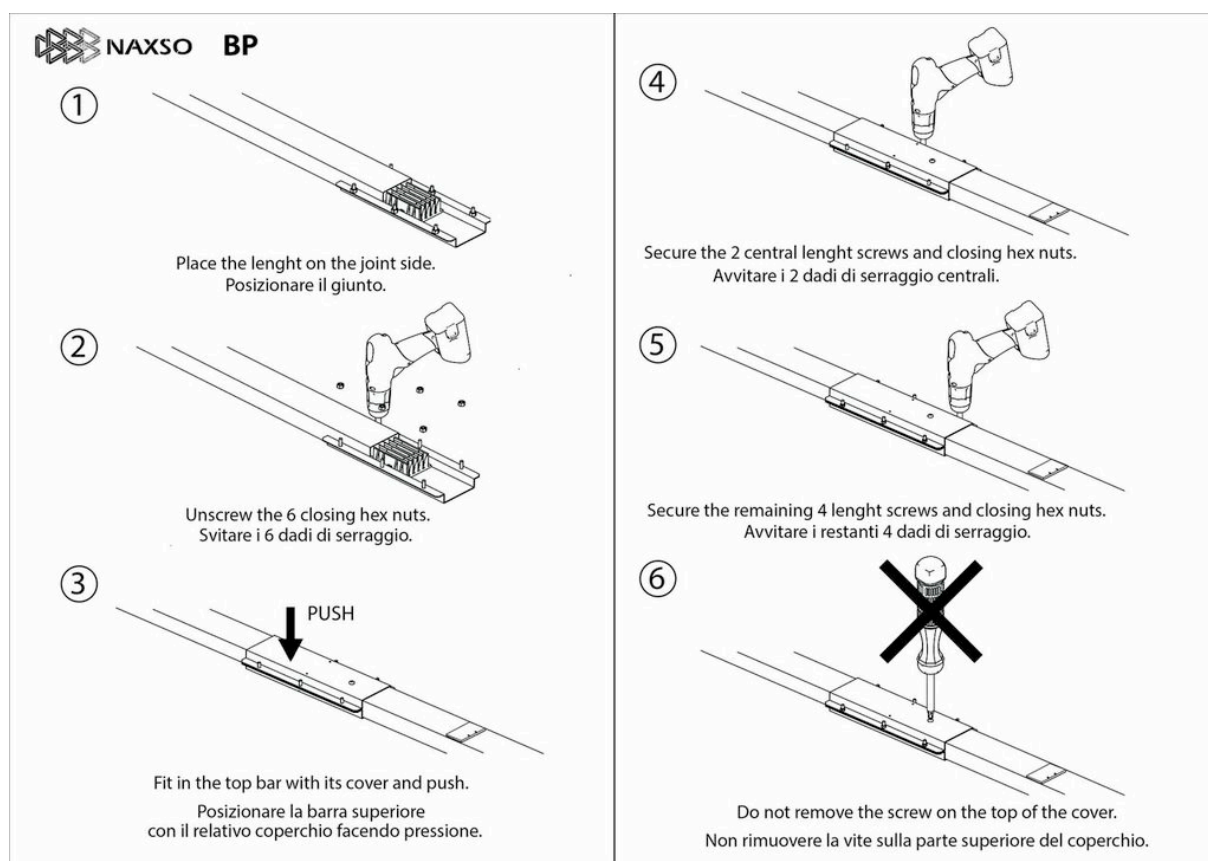
BP Range busbars come with a special joint with no need to close any internal bolt to secure the right contact between the two lengths. This is why the frames covers in the joint point should never be removed as shown in the below picture.



Do not remove the screw on the top of the cover.  
Non rimuovere la vite sulla parte superiore del coperchio.

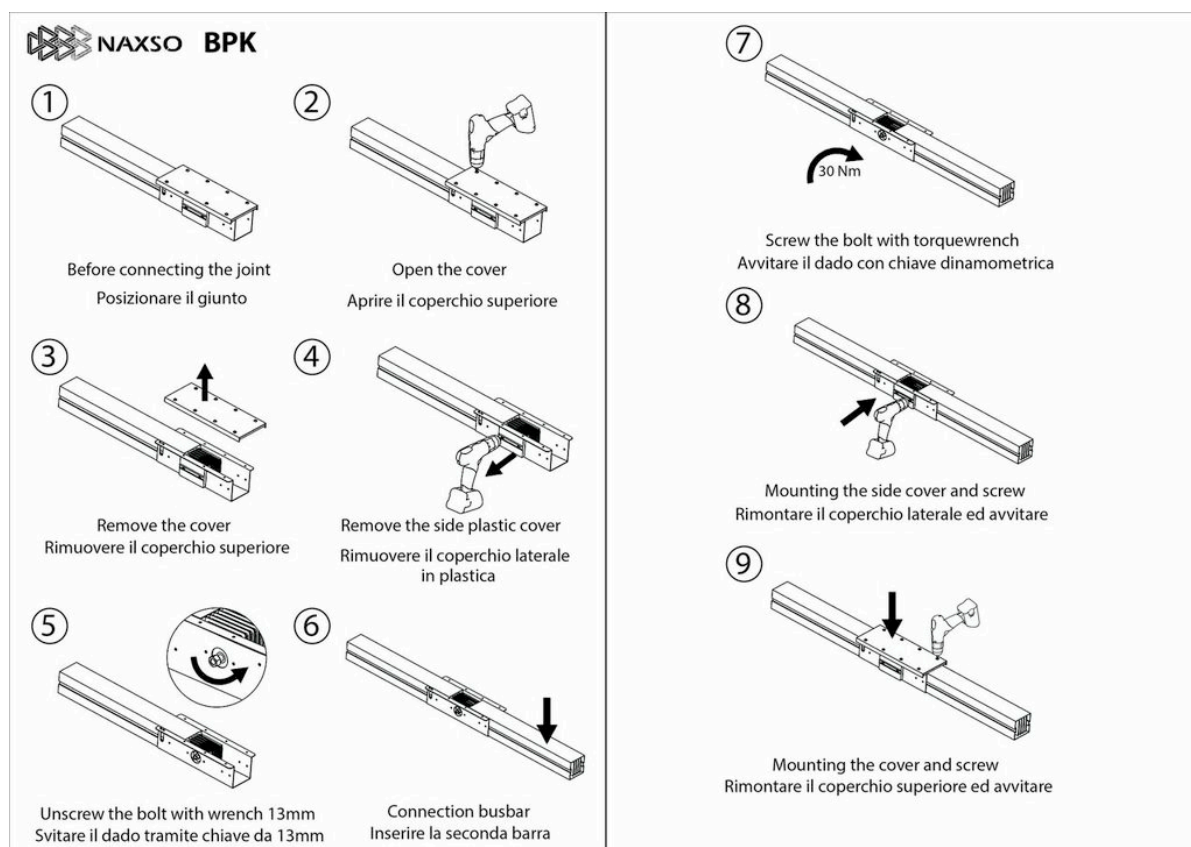


In order to close the joint in the right way you need to place the two lenghts as per instructions and follow all the highlighted steps.



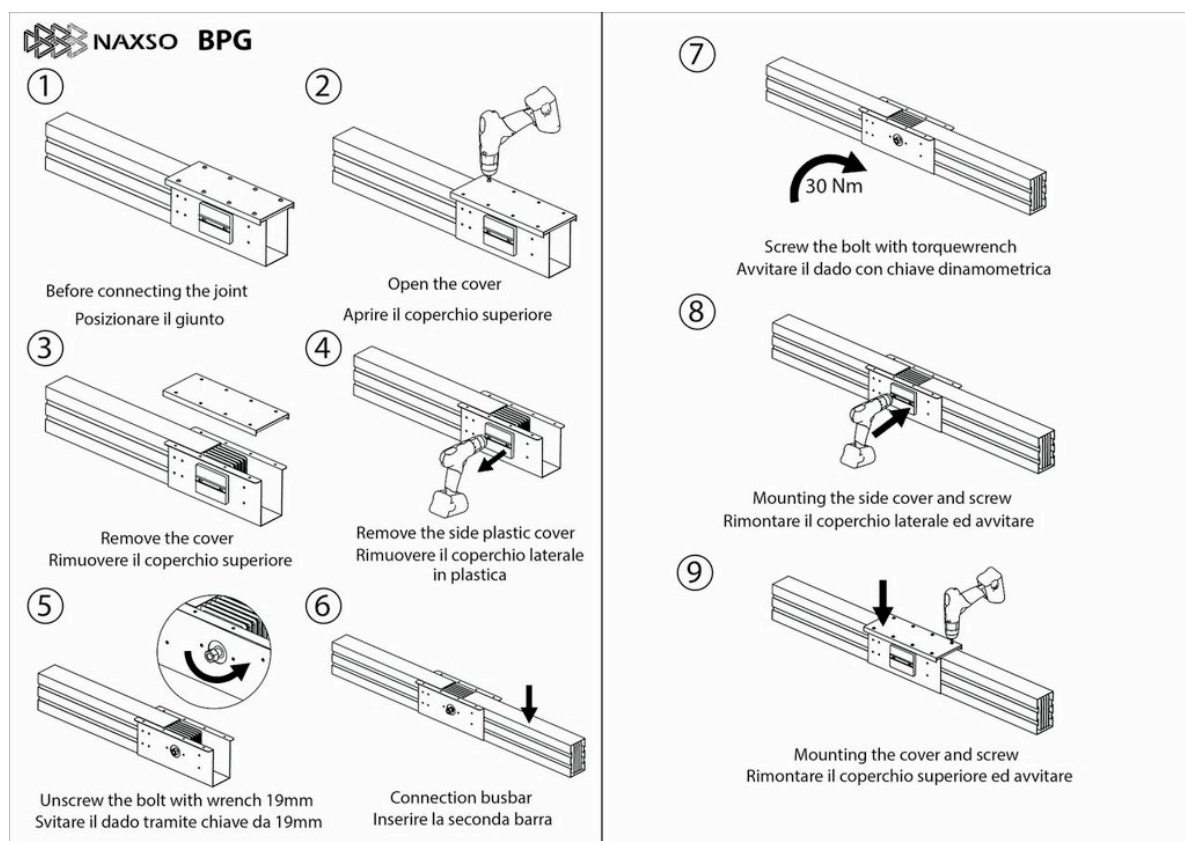
**BPK SERIES:**

BPK series come with an overlapping busbar system where conductors are placed face-to-face as per instructions. Once they are in position and connected the central bolt has to be screwed to guarantee a solid connection. At this point do not force the central bolt over the end of the thread. Extra-torquing will only damage the bolt thread.



## **BPG SERIES:**

BPG busways come with joint pack 1 bolt. Double round-spring washers are fitted to convey a stable pressure on the joint pack. Apply a torque from 25 to 30 Nm to the bolt. Do not overtorque this bolt otherwise this will result into compromising the all system functionality.

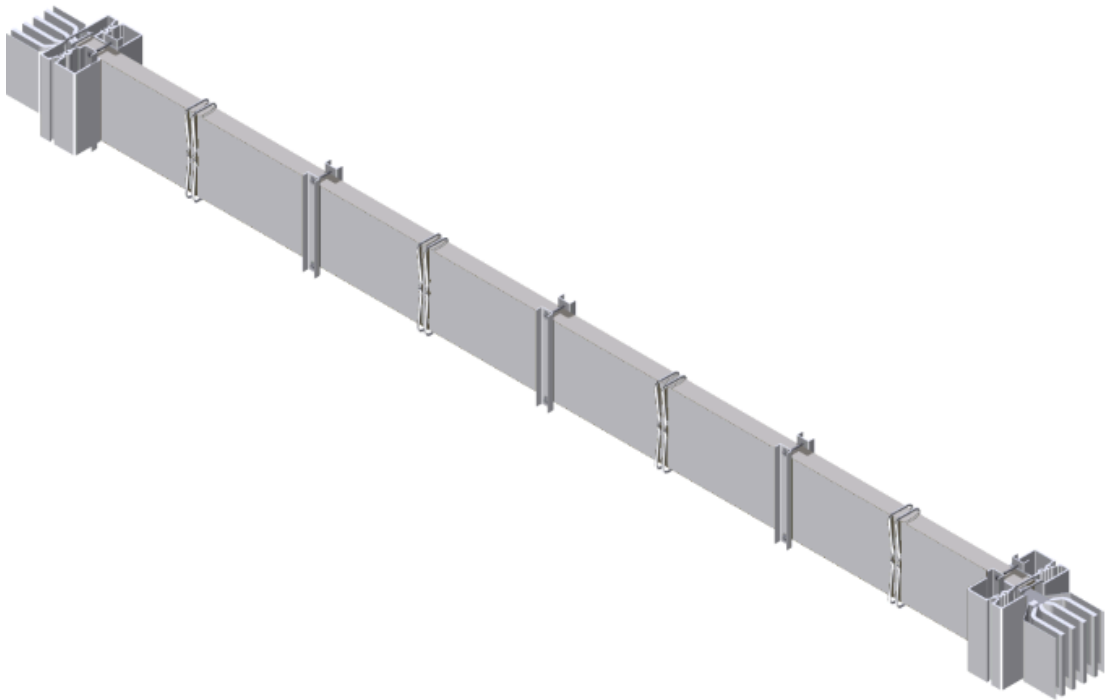


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# Busbar Quality Assurance

Naxso Srl • Torino • 2013

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# Introduction

## QUALITY AS A PRIORITY

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Naxso Srl is certified ISO 9001 and every year an operator from IMQ comes over and performs all the quality checks, fills in all the requested quality surveys and doublechecks the system improvement.

### The range

The Naxso sandwich range covers all the ratings between 800 and 5000 Amps in the standard ranges and higher ratings are available on request.

Main focus is given by the company to conductors that represent the core part in a sandwich busbar whose main purpose is to transfer high quantity of energy , so these are the main points tackled and checked by the quality department.

See the list below to learn how we address all the controls:

PART	INTENSITY
1 conductor alloy extruded	each single batch
2 conductors lenght - tolerance lenght	each single batch
3 conductors bending	each single part
4 conductors insulation	each single busbar
5 joint assembly	every 50 pcs

6 joint performance	every single project
7 insulation materials	each single batch
8 metal parts	each single batch
9 painting process	each single batch
10 final busbar assembly	each single unit
11 tightened bolts	one every 20 pcs
12 final insulation	each lenght 3500V
13 final assembly before delivery	one every 20 pcs
14 packaging	one by one pallet
15 documents procedure	see annex

## The details

Conductors alloy is scrutinized at the arrival from suppliers and the material is let in exclusively if complies with drawings and tolerances in lenghts. Tolerances are strict (+- 5mm) as higher tolerances result into bad connection in the joint.

Conductors bendings are checked after the conductors assembly to ensure the right interax and let the joint function smoothly. Interax strenght shall be 31 mm (+- 0,5)

Conductors insulation is checked when insulation materials come from the suppliers with testing equipment on every batch

3,5 KV on Mylar for the straight lenghts

4,5 KV on polyammide for joints

3,5 KV after the conductors pack assembly

3,5 KV one by one every busbar after final assembly

3,5 KV one random every pallet before delivery to check any problem experienced during packaging

## **THE JOINT**

Joint assembly is checked one every pallet when received from sub-suppliers and one random installed on a busbar before wrapping up.

An electrical temperature test is run at the rating for 4 hours and the electrical insulation of the system is stressed at 3,5 KV after temperature tests. The joint performance includes the one of the lateral washers which are tested at low and high temperatures. For low we mean -5 degrees at the limit of 80Nmt. The washers musn't have any crevice after 2 or more tightenings and the hardness not superior to the one stated in the drawings (+- 5)

## **INSULATION**

Insulation materials shall be checked after a temperature rise test at the limit (120 degrees necessary to spot any oil or surface crevice arisen after the temperature pick. Black smog traces are tested at 5 KV).

## **METAL PARTS**

Metal parts are checked in thickness and surface (hot dip galvanized) before the painting process. Non special recommendations on this point except that the bendings must not create any flake of zinc as this might seriously harm the insulation in case of rambling along the busbar.

## **PAINTING PROCESS**

A good painting is recognisable from:

- A) a good cover of painted material (at least 15 microns)
- B) an homogenous surface layer with a slight orange-skin effect
- C) the right PE unpainted parts where needed (top of sheet in the joint house area connection)
- D) the right colour number reference (RAL 7032)

## **FINAL BUSBAR ASSEMBLY**

A good assembly requires:

- A) a mechanical check of the bolts tightening
- B) a visual check of all the parts
- C) the distance among terminals-conductors (31mm / +- 0,5 mm)
- D) visual alignment of the conductors
- E) clean painted surfaces



F) dust-free environment

G) labels matching with ratings

H) tracking number matching with the docs

I) in-bound stock arrival date

J) supervisor sign on special label check

## **PACKAGING**

The proper packaging corresponds to the packing list and the dimensions forwarded to customer/agents/resellers and consists of:

- the correct single pallets/crates weight
- the right labels to customers for clearance in customs on every pallet
- pictures taken before final wrap-up ( to confirm the strenght and reliability of the bulk)

## **DOCUMENTS PROCEDURES**

- 1) packing list forwarded to customer via email
- 2) pictures caption
- 3) signed check from supervisor on the final documents
- 4) virtual-real weights correspondance
- 5) copies signed and handed off to delivery supervisor
- 6) trace of the tracking labels

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# CRITICAL POINTS IN A BUSDUCT

## CONDUCTORS - JOINTS - IP RATINGS

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### THE CONDUCTORS

Conductors have to be perfectly dimensioned in square mm . The bigger they are the better the busbar will work. There isn't a maximum dimension but there is a minimum one that according to the norms is " the dimension that turns the busbar hot under the nominal rating and if this is applied to the busbar for a long time after hours the temperature shall be stable without overcoming 50 degrees more than the ambient temperature".

On average 80 to 85 degrees is the maximum temperature expected on the busbar housing and an average internal conductors temperature around 90 to 100 degrees depending on the house capacity to dissipate heat.

According to the norms only a few points have to be observed:

A)after giving the nominal rating the busbar temperature soars.

This temperature can rise even for hours, but after 8 hours maximum, it is required to be stable. When this condition is reached the temperature test can start and this temperature shall be maximum 50 degrees more than the local environment. If after 8 hours the temperature is rocketing than the test has failed ( no matter if we encounter a temperature of 60-90

degrees since the norms allows only 8 hours to let the busbar rise at a stable temperature at the rating).

B) as soon as point A is respected then we need to meet the second key requirement: insulation. Insulation in all the busbars has to stand at least 10 degrees more than the maximum conductor internal temperature. So given a housing temperature of 80 degrees and the internal conductors-internal joint point at 105 degrees (there is no limit according to the norms) the manufacturer needs to demonstrate that all the insulations inside the busbar (conductor/joint/...) can easily stand for a long time at a 105+10 temperature. This demands the bar to stay at 95 degrees maximum (100 degrees internal and so the requirement is insulation class B-120 degrees to be on the safe side).

All the manufacturers and final users always take into account that the standard settlement for a temperature rise is a 6 mtrs busbar (2 lengths) plus a feeding unit and a terminal. 3 joints, 6 meters and no elbows.

All the lab tests are run with a poor line, meaning that the everyday installation witnesses some terminal lengths, some elbows and possibly many meters and many elbows.

A minimum 20-25% overdimensioning is suggested to be sure that the lab conditions are satisfied .

## THE JOINTS

The joint is the weak point of a busbar. The line is usually long and convoluted as told before and the joints are generally installed by the installation companies which need to focus intensively.

Even if the joint is perfect a bad tightening of the bolts will affect the correct performances.

In case of more than one bolt and high ratings a right balance among the bolts is expected so that the joint tightening is fully balanced (i.e: 3 bolts, two of them are tightened at 60Nm and the third at 75Nm. In this case it'd be better to have a joint where the bolts are tightened at 50Nm so that the contacts are balanced and all the conductors points come with the same pressure, with a stable current and an uniform flush). If a bolt is tightened at 80Nm and the remaining ones at 60Nm the conductors in both the busbar and in the joint have a non parallel position, the final result is a disaster.

We suggest to tighten all the bolts with no excessive strenght being able to create a sort of balance among them.

We strongly suggest to tighten all the joints at a lower strenght than required, let's say 50 instead of 60 or 70 and after applying tension.

After a while ( a few days) all the joints have to be revised and re-tightened at a higher value close to the one recommended by the manufacturer.

This operation will be performed when the line is hot few moments after shutting off the power and if the line is long we do reccomend to perform a part of the line, than put the line under tension and let is rise again. After a while shut down the current and perform the second part of the line.

## **IP RATINGS**

All the manufactures run the LAB tests at a nominal rating and nominal IP (usually IP 42 or 44). If the requirement is higher than the one used during the lab tests ( always true for IP 55 or 65 or

more) than the LAB results are not to be considered valid as IP is decreasing the results and the performances of the busbars.

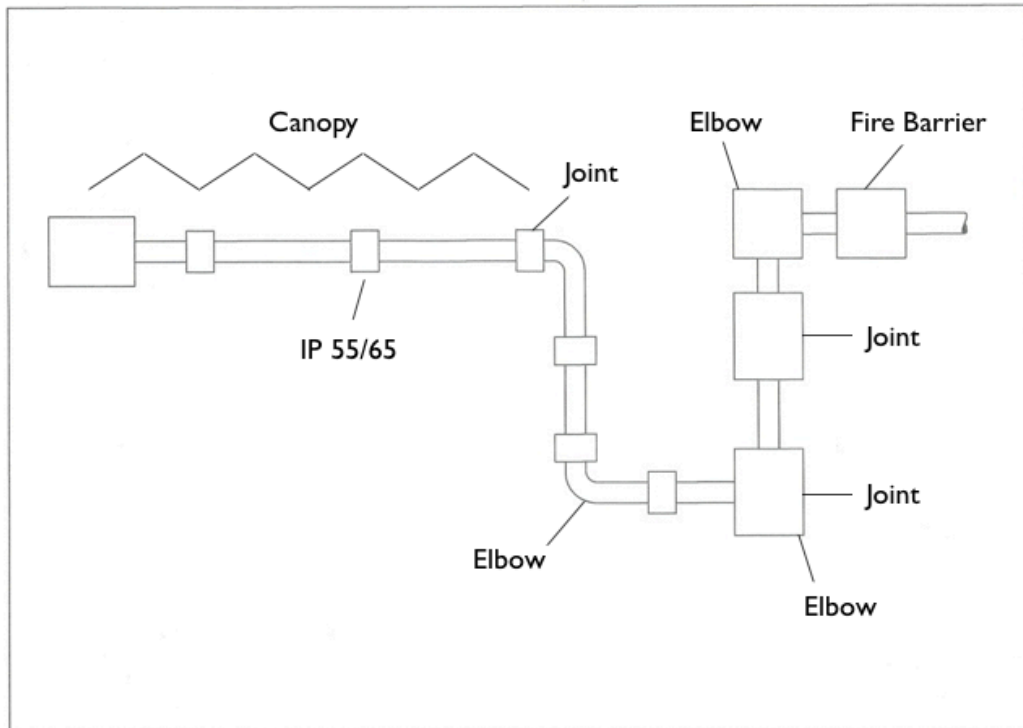
What affects the mentioned performances?

- IP ratings higher than IP44 worsen the performances
- Canopy to protect the busbar from rain reduces the performances
- Narrow installations to walls and ceiling decrease the performances
- Fire barriers highly affect the temperature performances
- A number of elbows higher than one every five straight standard length (around 15 mts) can decrease performances

Elbows are always leading to poor temperature performances and short-circuits.

See the below drawing to sort out the above issues

## AFFECTING AGENTS OVER PERFORMANCES



- A) high number of joints (tension drop). A line with more than 30 joints can experience critical conditions especially if we have situations like points B/C/D/E
- B) high number of elbows (short circuit / temperature). In case of more than 15 elbows in a line we do suggest to increase the rating by 1 step
- C) IP > 44 (temperature). IP55 or superior can decrease the performances in tension drop and dramatically increase the temperature.
- D) Canopy (temperature). Canopies stretching on a long length (more than 6 mts) can affect the temperature.

## NOT TO DO's

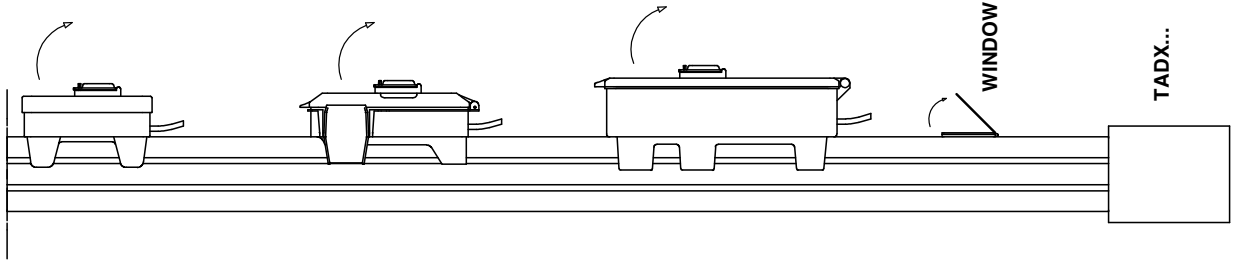
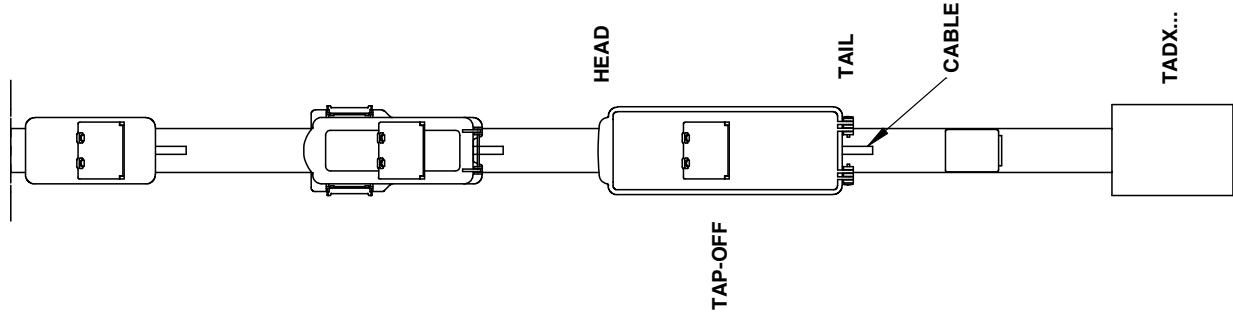
So please follow the below indications



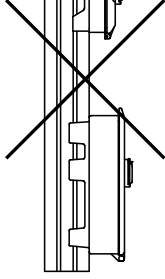
- It is strictly forbidden to dismantle a busbar, unveil the conductors and make a feed unit from them

- It is absolutely prohibited to use a tap off as a feeder unit or as a central feed unit in any rating busbar from lighting to sandwich
- It is forbidden to dismantle a terminal from a tap off wheter it's power or sandwich and perform a transformation to a new or different tap off. Every single tap off is designed with very small tolerances and clearance and extra-fitting technical and mechanical structure.



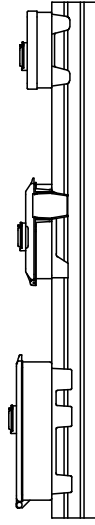


HEAD DOWN



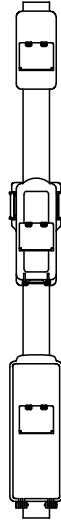
NO

HEAD TOP



OK

HEAD SIDE



OK

Cod. Trumpf	Cod. As 400	Disegno N°
Ubicazione Site	Materiale Material	Drawing Nr.
Cliente Client	Prodotto Item	Revisione Revision
		Revision
		Scale 1:10
		Formato Size A4
		Foglio N° 1
		Segue N° Of Nr.
		Riferim. CAD
		CAD Reference
		Disco N°
		Disk Nr.
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Titolo Title		RISER INSTALLATION		TAP-OFF INSTALLATION	
Disegnato Draw	Tamagnone Fabrizio	Data Date	15/10/2014		
Controllato Checked		Data Date			
AutORIZZATO Authorized		Data Date			
Approvato Approved		Data Date			