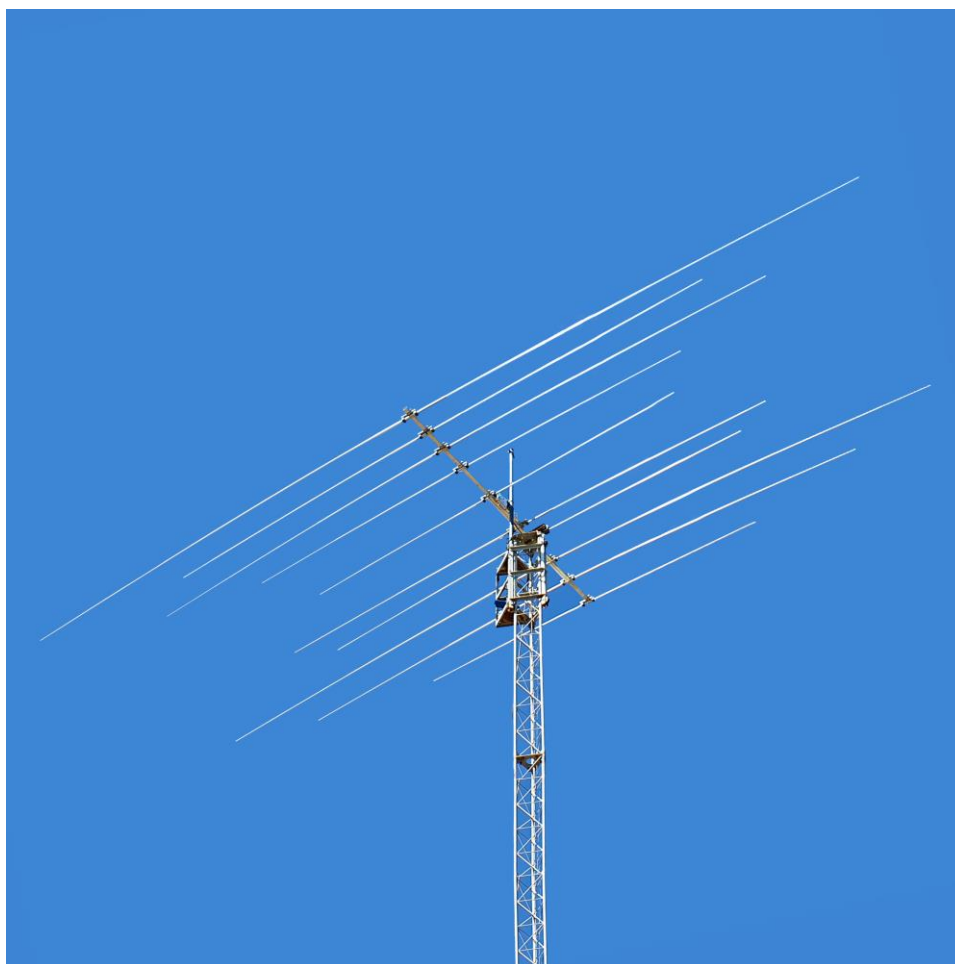




PENTA10 10-12-15-17-20

Five Bands Yagi Antenna

28MHz - 24MHz - 21 MHz - 18 MHz - 14 MHz



ASSEMBLY MANUAL

Momobeam

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Please, carefully read this assembly manual before starting to assemble the antenna.

Thank you for purchasing a Momobeam antenna! This manual will guide you to the correct assembly and mounting of your new antenna. Momobeam designs are based on the latest versions of computerized simulations and confirmed by field tests. Momobeam antennas are very easy to assemble thanks to the grouping and labeling of components. Please be considerate your environment by disposing of all waste in proper, climate safe locations, if you can, recycle the packaging.

Momobeam Limited Warranty and Liability

Momobeam warrants to the original purchaser that this product will be free from defects in material and workmanship for a period of two (2) years from the date of purchase. Momobeam will solely determine whether a part will be covered by this limited warranty and whether a part will be repaired or replaced. Such determination will be made following the evaluation of alleged defect. Momobeam will evaluate if misuse, abuse, unauthorized modifications, extreme weather conditions or improper installation occurred. This warranty does not cover delivery, transportation, installation or any other cost that may be incurred from any defect. Shipping costs for any repairs, replacements or returns will be paid by the buyer and must be prepaid. Before proceeding with the evaluation, Momobeam will have to receive appropriate documentation that helps identify any defect. The purchaser, final customer, installer and user of Momobeam products acknowledge that these products can cause injury or death and accept full responsibility and liability for any and all damage to persons and to property (direct, indirect and punitive) caused during installation and subsequent use.

Warning

Do not install this antenna where there is any possibility that the antenna or any part of the supporting structure could come in contact with power lines or any electric circuit. If the antenna comes in contact with electric circuits, this could result in electric shock or loss of life. Also ensure that no people or pets can come in any contact with the antenna after it is installed. Dangerous voltages can exist on the antenna when it is in operation and no part of the system is insulated to prevent electric shock. Momobeam antennas are not designed to be used as support structures. Persons or objects should never be supported by or suspended from the antenna structure. It must be taken into account that falling parts may cause a hazard to people, animals and property on the ground below.

Disputes For any dispute, only the Marsala - Italy headquarters is your point of contact and has the final authority.

Momobeam antennas are designed and manufactured in Italy

Contact If you have any questions regarding the assembly or operation of this antenna, please contact Momobeam:

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Assembly suggestions and materials

Momobeam antennas is made of aluminum tubes, aluminum straps for phasing lines, stainless steel hardware (bolts, nuts, washers, U-bolts, saddle clamps), POM-C UV-Resistant driver element insulators and polypropylene clamps. Stainless steel is very sturdy, but sometimes you might experience hardware seizure when you tighten or loosen some stainless steel parts. The seizure is mainly due to the chemical nature of the material that undergoes a sudden heating of surfaces due to friction during assembly. If this happens, a nut can become seized and it becomes necessary to force the tightening until the bolt breaks and then proceed with its replacement.

Spare parts (selected items) are included in case of loss or damage that might occur during assembly or installation.

It is strongly recommended that you lubricate stainless steel hardware before tightening it to prevent seizure. Penatrox (or similar) is the recommended lubricant.

Prior to assembly of any stainless steel hardware (screws) the threads should have a lubricant applied. If you are removing a stainless steel nut that has been installed, it can help to apply a lubricant before removing it to prevent seizure. If during the removal or tightening of a nut you feel a lot of resistance, stop immediately and apply a lubricant. After that, work the nut in the opposite direction to allow the lubricant to work.

Do not over-tighten. Extreme force is not required in the assembly of this antenna! Once hardware begins to seat firmly, it only takes a few more turns to properly secure parts. The self-locking nuts provided will prevent hardware loosening.

When securing clamps and U-Bolts, apply even torque between the bolts.

To make the antenna assembly operations easier, equip yourself with two saw horses or large flat surface. The shipping container makes a useful flat surface that can be placed between the saw horses for the assembly process.

The boom is marked for simple assembly and marked for element placement/alignment (A, B, C, etc. notations) and the center of the boom is labelled for quick positioning of the boom-to-mast mounting plates.

Each element is labelled and its parts are bundled together and/or telescoped.

Hardware is packaged in labelled bags.

Some parts (like driver element center sections) come pre-assembled.

This makes the assembly of Momobeam antennas very easy and intuitive.

The Momobeam RF choke (supplied) is placed between the coaxial feed line and the feedpoint. Any high quality choke used should not have lead lengths longer than 2 inches.

NOTE: Reference to Standard American English (SAE) or Imperial units are approximate where noted.

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PENTA10 1012151720 (PENTA10) is a full-sized Yagi antenna for amateur radio operation that covers five HF amateur radio bands (14/18/21/24/28 MHz) and it is designed for maximum performance. It uses 10 elements on a 12.8 ft boom with:

- 2 elements, reflector and driver on the 20 meter band
- 2 elements, reflector and driver on the 17 meter band
- 2 elements, reflector and driver on the 15 meter band
- 2 elements, reflector and driver on the 12 meter band
- 2 elements, driver and director on the 10 meter band

No traps are used in the design, providing the maximum performance. The antenna is a direct 50 ohm feed through a single coaxial cable connected to an RF Choke (included).

Momobeam antennas are designed to operate over a large bandwidth for each band. No adjustment to the antenna is necessary if the assembly is in accordance with all instructions. Install this antenna at an height not less than 10 m / 30 ft.

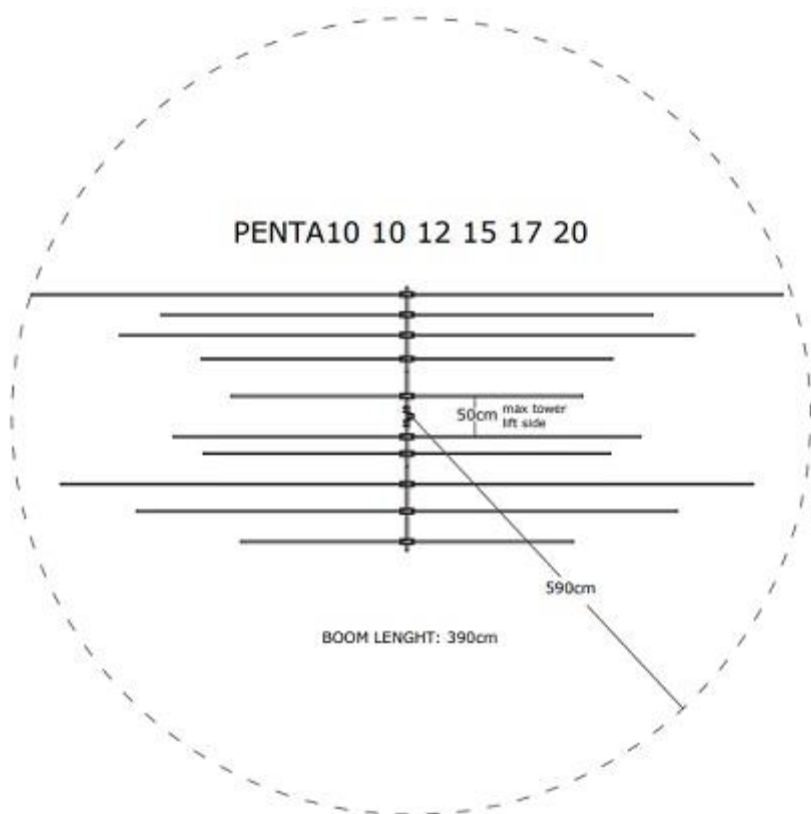
Tools Supplied by Momobeam

Allen/hexagonal tools are used for the bolt heads. Nylock nuts use sockets.

Suggested additional materials: Protective gloves; anti-seize compound (Penatrox).

NOTE: There will be additional hardware items remaining after final assembly (Spare parts).

Also included is spare element tubing.



SPECIFICATIONS

BAND	10 meters (28 MHz)	12 meters (24 MHz)	15 meters (21 MHz)	17 meters (18 MHz)	20 meters (14 MHz)
Gain dBi*	12,3	12,5	11,5	11,6	12,0
Gain in free space dBd	4,7	4,9	4,0	4,1	4,5
Front/back	25	15	15	15	15
Elements	2	2	2	2	2
SWR	800 KHz	100 KHz	450 KHz	100 KHz	350 KHz

Longest element: 1100cm / 36ft.

Boom lenght: 390cm / 12.8 ft.

Max tower lift side: 50cm

Closest element to mounting point: 25cm/10 inches

Turning radius: 590cm / 19.4 ft

Feed: 50 Ohm balanced – single coaxial cable

Mast diameter: 50 to 60mm 2/2.4 inches (larger on request)

Wind area: 0,79 m² / 8,6 sq ft.

Wind survival:** 160 Km/h – 100 MPH

Wind load 130Km/h: 635 N

Balun: 3 KW rated included

Weight (excluding packaging): 27kg / 60lbs.

* gain at 20m height on real ground

** maximum wind speed at which there is no permanent deformation of the antenna

Assembly process suggestions:

- 1. Assemble Boom (Step 1 and Step 2)**
- 2. When the center sections of each element are assembled on their mounting plates (Step 3.1), rotate the boom and attach the elements (center sections) to the boom.**
- 3. Keep the Boom upside down while completing Step 3 (3.2, 3.3 and RF Choke), then rotate the boom back such that the elements are now mounted on the bottom prior to Step 3.4.**

STEP1 - BOOM ASSEMBLY

PENTA10 boom is made of 3 parts that comes bundled together. The center part is a square tube 50x50x2mm/2x2x.08 inch, 140 cm/55 inch long; the terminal parts are square tubes 45x45x2mm/1-3/4 x 1-3/4 x .08 inch, 140 cm/55 inch long.

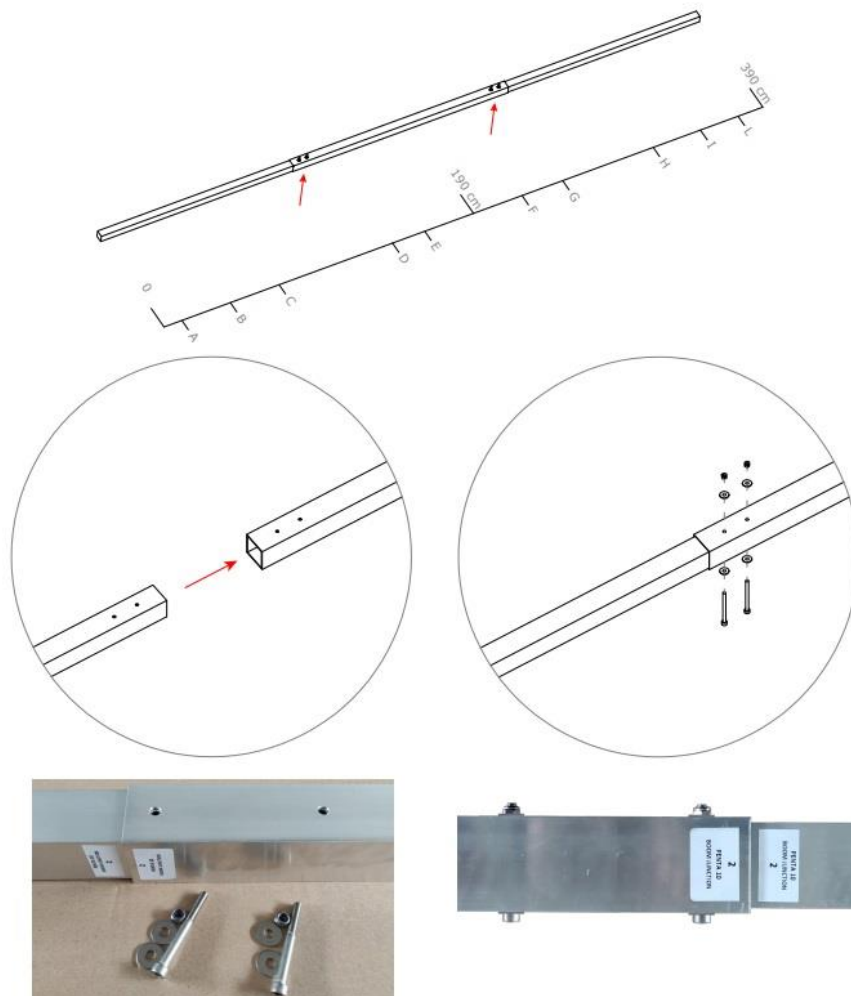
The boom is telescopic so the end sections (2) fit in the center section. The sections have Junction Markings (1 and 2). Match Junction 1 with 1 and 2 with 2. **With the element markings (A, B, C, etc.) showing on the bottom of the boom now assemble the boom sections.**

The center part has 4 holes, two on each end. The terminal parts have 2 holes, only on one side. Boom parts are joined together with four bolts, four nuts and eight washers in total. The hardware is found in the "**Boom junction**" bag.

Please note the labels on each part.

- 1- Align all parts matching the labels on each boom section.
- 2- Take one of the terminal parts and fit it into the center part, until holes align.
- 3- Take two bolts 6x70mm and insert one washer per bolt.
- 4- Lubricate stainless steel bolts before tightening it to prevent seizure.**
- 5- Insert bolts+washers into holes and secure both parts with one washer and one nut per bolt.
- 6- Repeat the same on the other terminal part of the boom.

Do not over-tighten. Extreme force is not required! Once hardware begins to seat firmly, it only takes a few more turns to properly secure parts.



STEP 2 – BOOM-TO-MAST PLATE ASSEMBLY

Locate the **PENTA10** boom-to-mast plate inside a bag that contains: one 160x180x10mm/6,2x7x0.4 inch plate with 8 holes, one 160x80x5mm/6,2x3x0.2 inch counterplate with 8 holes, one rectangular tube 50x20mm/2 x ¾ x inch 18cm/7 inch long (boom spacer), one "Boom to mast plate" hardware bag, one "**U-bolt**" hardware bag.

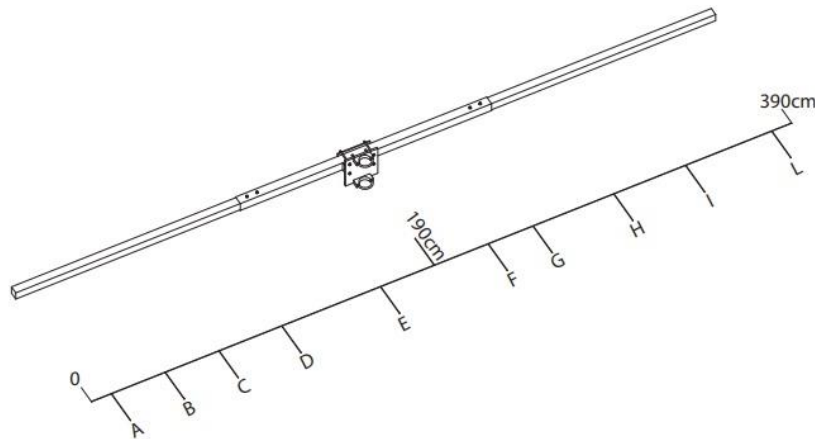
The center of the boom-to-mast plate must be positioned at **190cm/75 inch** from the starting point (Element A); also note the boom-center label for additional guidance.

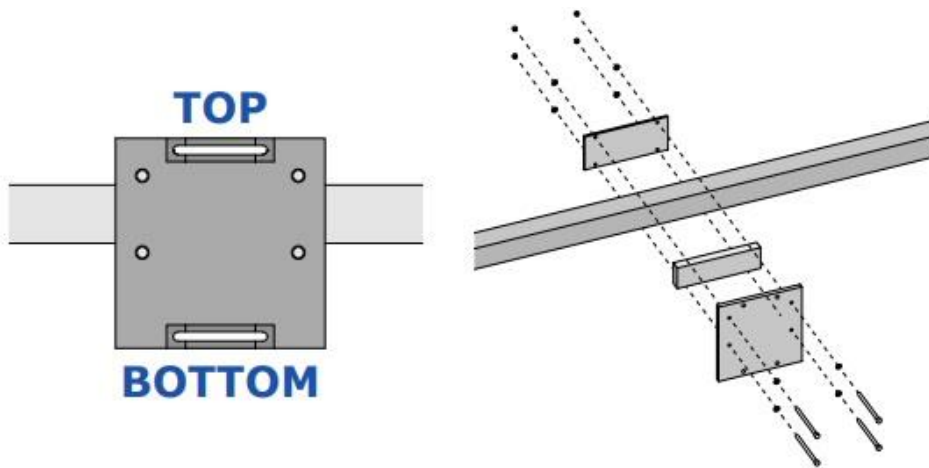
Note: The boom-to-mast plate is placed at the center of the space between the E and F elements as shown in the picture. The position is also marked on the boom (see *Boom to mast plate position* picture).

Between the plate and the boom must be placed the "spacer" rectangular tube.

IMPORTANT: The boom-to-mast plate is NOT symmetrical and must be assembled as shown in the picture.

Note: The boom-to-mast plate must be mounted perpendicular to the ground.





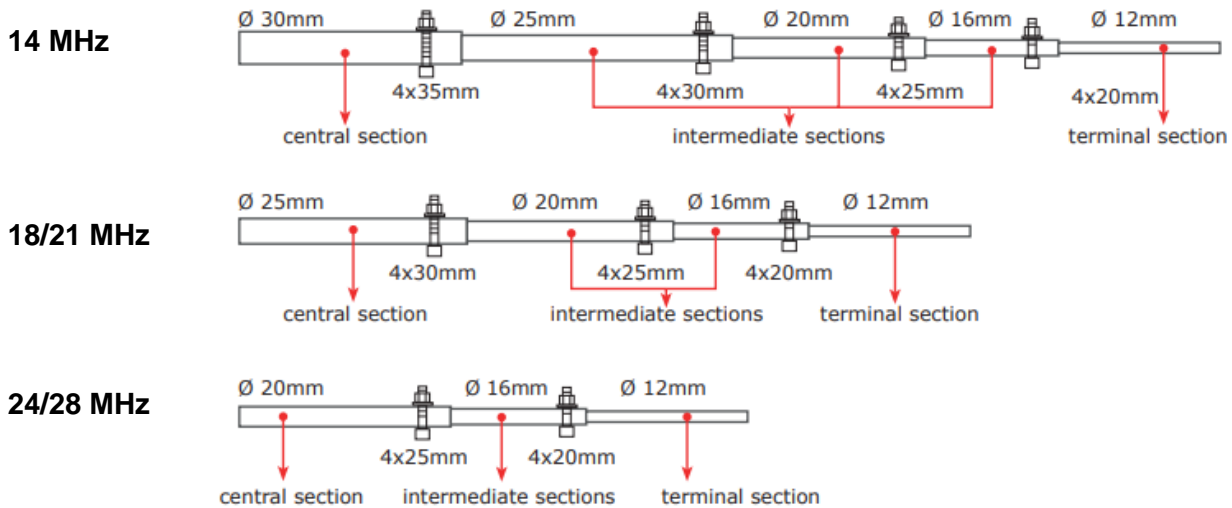
Boom to mast plate position



Suggestion: The Boom should now be rotated such that element plate assembly can be done on the top side of the boom. Element location markings on the boom should now be on top.

STEP 3 - ELEMENTS ASSEMBLY

Elements are telescopic, which means there is a section with a diameter larger than the others. This section is the center one (mounted closest to boom) and it must be mounted to the boom plate and secured through the polypropylene clamps. Each element is tapered and the taper runs smaller towards the tip. Each section slides into another.



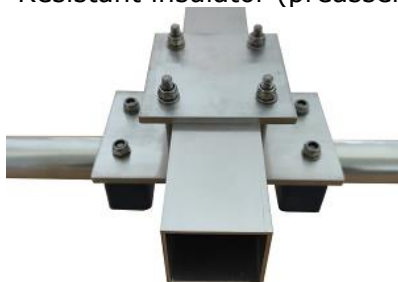
Elements are labelled. Parts of the same element are bundled together for easy and intuitive assembly.

You will find the following bundles:

Element A Reflector 20m
Element B Reflector 15m
Element C Reflector 17m
Element D Reflector 12m
Element E Driver 10m

Element F Driver 15m
Element G Driver 12m
Element H Driver 20m
Element I Driver 17m
Element L Director 10m

Elements E, F, G, H, I are driver elements. Their central section is divided in the middle through a POM-C UV-Resistant insulator (preassembled with insulator, 2 bolts, 2 washers and 2 nuts).



Top view



Bottom view

In order to be assembled on the boom, each element central part needs:

- 1 plate, 1 counterplate, 4 M6X70 bolts, 8 washers M6, 4 self locking nuts M6
- 2 polypropylene clamps, 4 M6X50 bolts, 8 washers M6, 4 self locking nuts M6



Plate kit

STEP 3.1 - ELEMENT PLATES ASSEMBLY

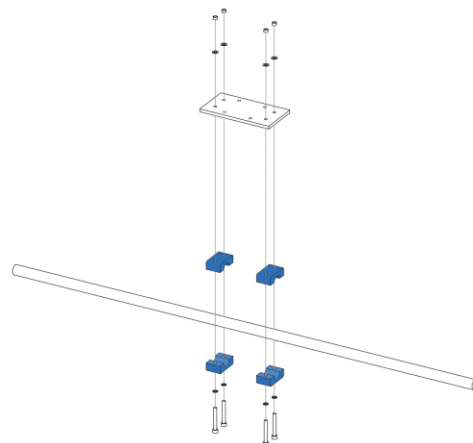
1- For each element, locate the corresponding clamps and plate following the labels. Assemble the element's center parts on the plates, placing the two halves of insulating clamps at the extreme end holes of the plate.

2- Place the element center section in the clamps saddles. Important: The label (for elements A, B, C, D, L) or the POM-C UV-Resistant insulator (for E, F, G, H, I elements) must be centered between clamps.

Based on the suggested assembly process, place the tube such that the larger holes (at the end of the element section) face upward. The bolt heads in the middle of the driver elements are on the bottom, closest to the mounting plate.

3- Place the second half of the clamps and secure them using 2 bolts M6X50, 2 nuts and 4 washers for each clamp. You will find hardware in "**Clamp Hardware**" bag.

Tighten bolts firmly. Make sure clamps are tightened evenly alternating between the bolts. There should be no gaps between the two insulating clamps. Do not over tighten.

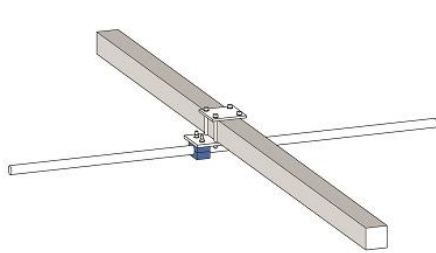


STEP 3.2 - ELEMENT PLATES ASSEMBLY TO THE BOOM

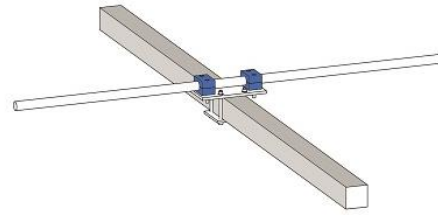
After all plates with the center element sections are assembled, mount them to the boom using the counterplate, four bolts M6X70, eight washers M6 and four self locking nuts M6. Hardware is located in the "**Element plate to boom hardware**" bag.

Based on the suggested assembly process, the element plates and the element center sections must be mounted on the top of the boom, while the counterplate must be placed on bottom. Plate positions are marked on the boom. Place the plates + center element sections in the marked position on the boom.

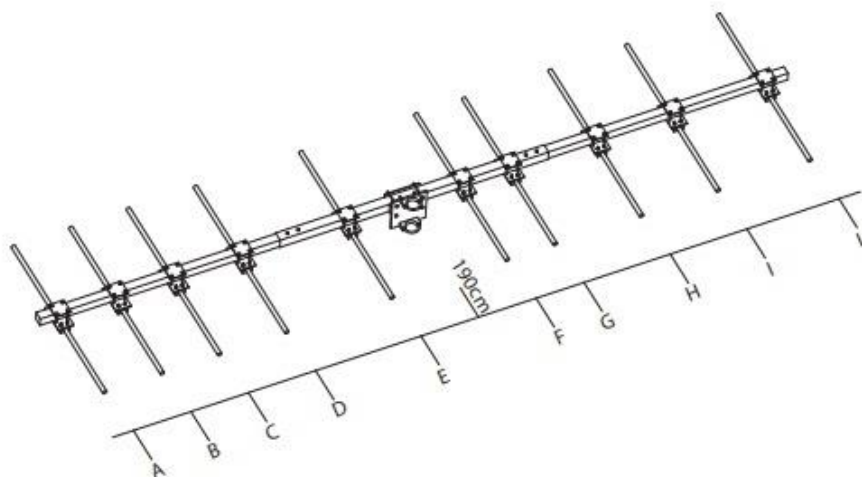
Important: For driver elements (E/F/G/H/I) loosely tighten counterplate bolts as slight adjustment might be needed to the position when assembling the phase lines.



Top view



Bottom view

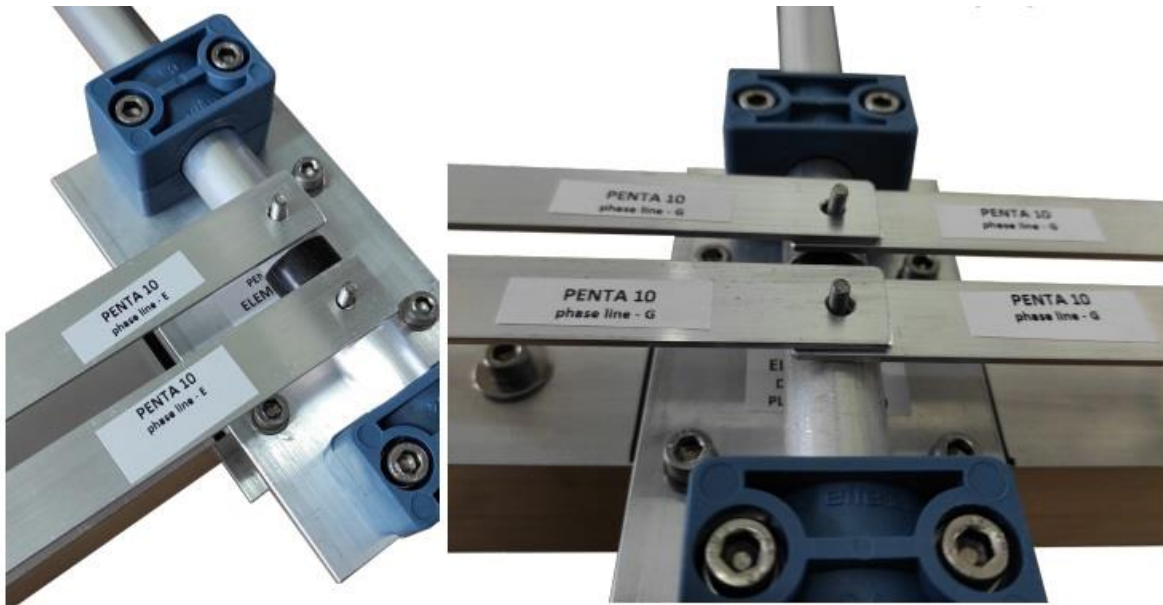


STEP 3.3 - PHASE LINES ASSEMBLY

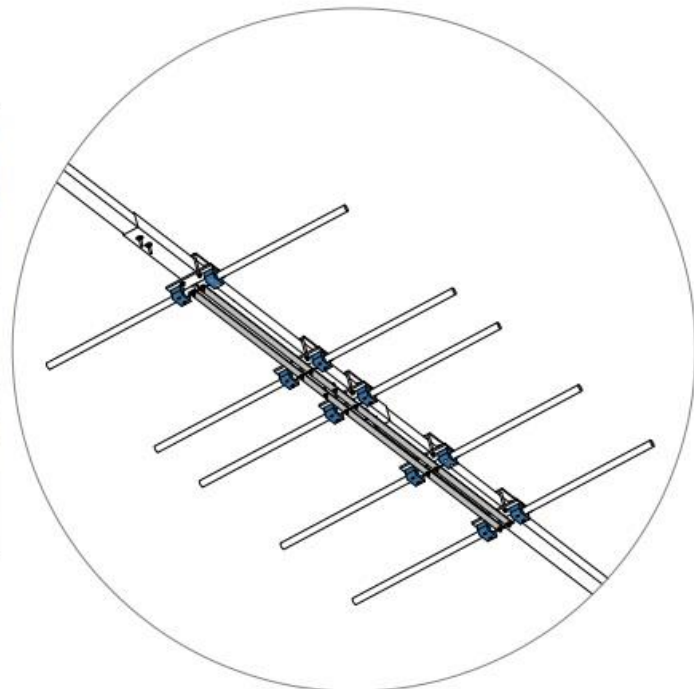
With the boom rotated per the assembly suggestion, now insert the "phase line" so that they all fit the driver element bolts that are preassembled and comes out from the middle part of the element center section (elements E / F / G / H / I). Please note the band markings (labels) on the phase lines.

- 1- Unscrew the nuts that come out from the bolts on the middle of the driver section.
- 2- Remove the washer and insert the phase line in the bolt.
- 3- Insert the washer and secure with the nut. It might be necessary to slightly adjust element distance, adapting it to the holes in the phasing lines or slightly rotating the driver element in order to insert the phasing lines correctly.

Once both phasing lines and all plates with all center element sections are attached, check all spacings between the elements and then firmly tighten all bolts.



BOTTOM VIEW

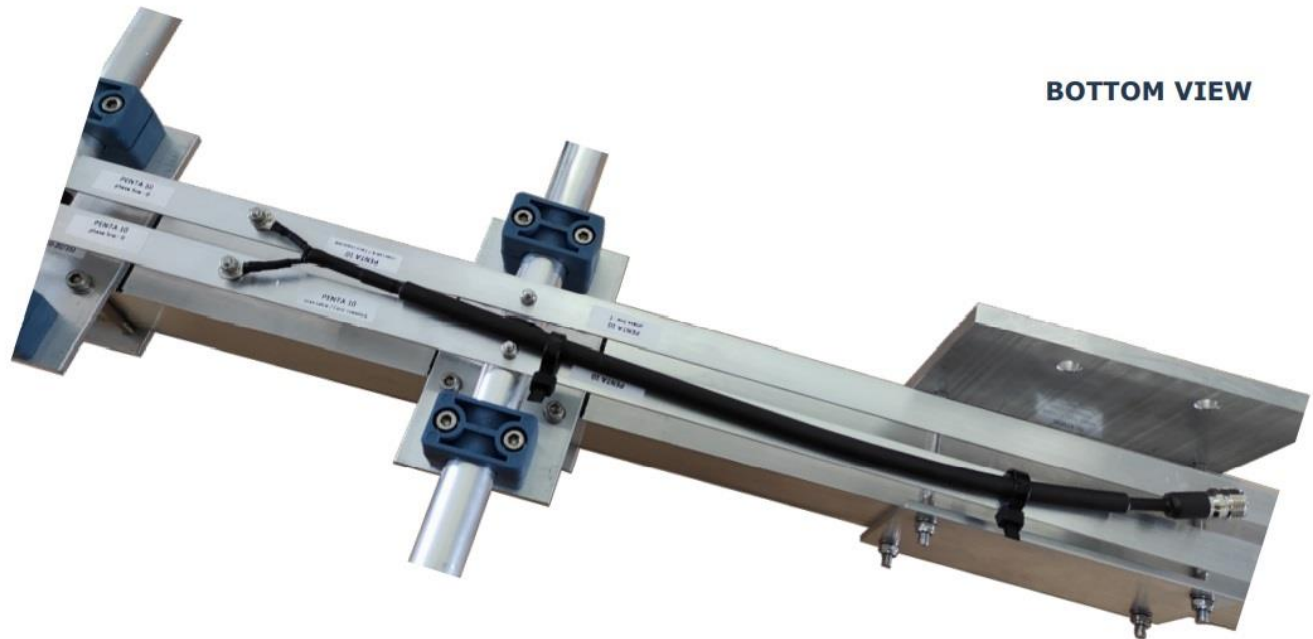


RF CHOKE

PENTA10 comes with a 3 KW rated RF Choke. Other higher power levels are available and may be purchased separately (5 KW and 10 KW).

The RF Choke must be connected to the phase lines as shown in the picture below. The choke is fixed to the phase lines with tie wraps (supplied), be careful not to crush or deform the choke while tightening the tie wrap or change the position (as pictured below) relative to the phasing lines.

Remove one nut and one washer. Position ring terminals of the choke, then add the washer and secure with the nut.



BOTTOM VIEW

STEP 3.4 - ELEMENTS SECTIONS ASSEMBLY

Suggestion: Now rotate the boom such that the elements are under the boom.

Slide each tubing section out to align with holes and secure junctions with one bolt, one washer and one nut to assemble the element.

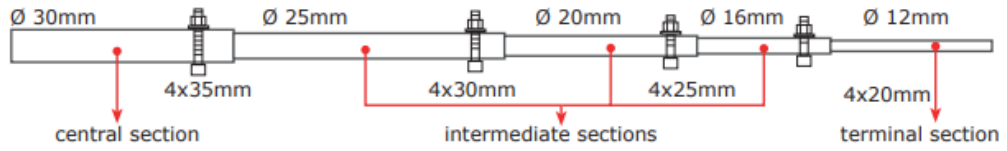
The hardware of the elements is divided by element. You will find a 14 MHz bag for A/H elements, one for 18 MHz C/I elements, one for 21 MHz B/F elements, one for 24 MHz D/G elements , one for 28 MHz E/L elements.

Please note that the holes on elements parts have two different sizes.

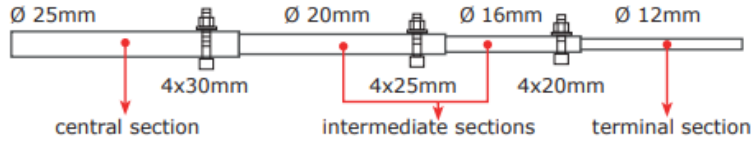
The head of the bolt must be inserted into the larger diameter hole, through the smaller diameter tube and it must exit through the small hole in the larger diameter tube on the opposite side. This creates an excellent electrical connection and a high strength mechanical junction. All larger diameter holes must face downward.



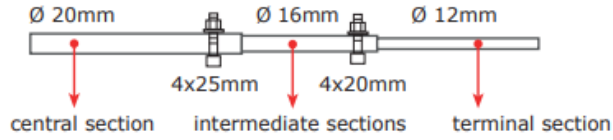
14 MHz



18/21 MHz



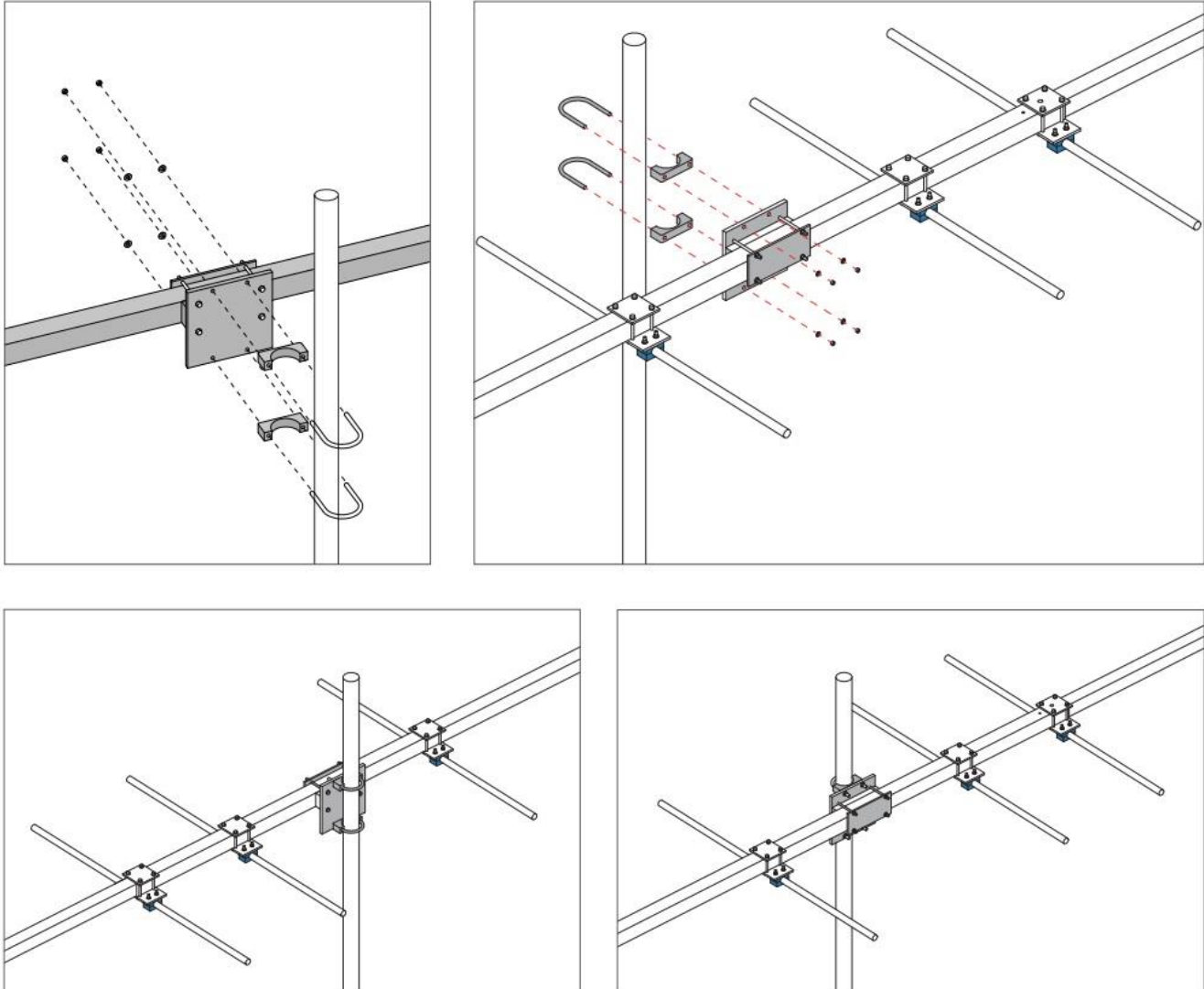
24/28 MHz



STEP 4 – MOUNTING THE ANTENNA ON THE MAST

Once the antenna has been assembled, elements on the bottom side of the boom, it must be mounted on a support at a height of not less than 10m/30 ft. It is recommended that this operation is done by a professional installer or experienced party. Make sure that the mast on which the antenna will be mounted is of a diameter compatible with that of the U-bolt supplied with the antenna (50/60mm - 2/2.4 inches).

Now proceed to mount the antenna to the mast as shown in the figure below. Mounting hardware is 2 Ubolts, 2 saddle clamps, 4 M8 washers, 4 M6 self locking nuts. Hardware is found in the "**U bolt**" hardware bag.





TROUBLESHOOTING

SWR significantly higher than specified values?

- Check the connections of the coaxial cable between transmitter and antenna (connector soldering, cable continuity and SWR with a proper 50 ohm load).
- Check the operation of the RF Choke – same as coaxial cable test above.
- Check all measurements and spacing.

Interaction with nearby metal objects or other antennas

If no errors are found in the measurements, it is likely that your new Momobeam antenna has been mounted at an insufficient height (less than 10 meters) or it is possible that there is an interaction with other antennas or metallic objects (if they are less than 3 meters / 10 ft away). If it is not possible to increase the distance between the antennas, try to rotate the interfering antenna 90°.

Hardware

On occasion, hardware may become seized when you tighten or loosen some stainless steel parts. The seizure is mainly due to the chemical nature of the material that undergoes a sudden heating of surfaces due to friction during assembly. If this happens, a nut can become seized. If this happens, it is necessary to force the tightening until the bolt breaks and then proceed with its replacement.

It is strongly recommended that you lubricate stainless steel bolts before tightening it to prevent seizure.

General Preventative Measures

In case of strong winds, please place the antenna so that the boom faces the wind. This way you will avoid excessive stress on the antenna elements.