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optimum short-wave antennas

computer-designed / computer-optimized

developed by hams for hams

OB 1 – 80+

Rotary Dipol(e) 80m for SSB and CW operation

!!! Quality made in Germany !!!

Entwicklung, techn. Beratung, Information und Vertrieb / development, techn. consulting, information and distribution:

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1. Introduction

The OB1-80+ is a high performing rotary dipole for the 80m band.
A specialty of this Yagi is that it can be switched between SSB and CW operation by means of a relay function.

OptiBeam shortwave antennas are designed and optimised by support of modern techniques such as computerised antenna simulation and are finally adjusted by extensive tests in practice.

To reduce the rather big wing span of an 80m element high Q coils (no traps), carefully fabricated by OptiBeam, and a special high efficient end loading are used. Hereby achieved is an almost loss free shortening of the element length.
So a gain is realised which is very close to that of a full sized element which would be about 2 ½ times as long as the OB1-80+ and the power capability is principally unlimited.

In the following table the essential electrical and mechanical data can be seen:

Bands	80m
Gain (dBd)*	0,0
Gain (dBi)**	6,1
F/B (db)	0
SWR: **3,770 - 3,790 - 3,820** **3,500 - 3,520 - 3,550**	 1,7 - 1,1 - 1,7 1,7 - 1,1 - 1,7
Impedance (Ohm)	50
Elements	1
Max. element length (m)	17,60
Turning radius	8,80
Weight (kg)	21
Windload at 130 km/h	590 N / 0,74 m² / 8,0 feet²

* = average gain over a dipole in free space
gain of monobanders for comparison: 2-element Yagi: 4 dbd, 3-element Yagi: 5-6 dbd
** = average gain at 30m above ground

2. Assembly

The included schematic diagram is needed for the assembly and the following information is given:

-> measurements of the element sections (length and diameter)
-> lengths of the element halves

The lengths are given in m (meters) and the diameters are given in mm (millimetres).

2.1 Sorting the parts

The antenna to a high amount consists of already pre assembled parts.
All parts of the antenna are marked.

2.2 Element-Platform

For the element-platform a 4-cornered U-shaped plate, 700 mm long, is used. The insulation and solid fixing of the element is realised by 4 special UV stabilised tube holders, mounted on the platform.
The element middle section (d = 60mm) is already inserted into the platform (see picture on picture page).

On the platform left and right of the element centre you also find the already installed loading coils which electrically lengthen the element for CW operation and which are brought in function by a relay switch.
Furthermore you find the relay box installed below the element middle section.

For the standard direct 'mounting to a mast' a right angle platform with two inserted U-bolts is mounted on top of the element platform (no extra picture included).

In case the OB1-80+ should be mounted on the boom of another antenna the U-bolts are directly inserted into the platform (like on OB2-80+, see corresponding picture on picture pages).
When finally tightening the U-bolts pay attention that the element is **parallel** in the vertical and horizontal plane. For the tightening procedure use the included special tool (nut driver M13).

2.3 Screw connections of the element sections

2.3.1 SEGMENT TRANSITIONS 60/55, 55/50, 50/45, 45/40 and 35/30mm

To achieve a special stability the sections on the first five transitions have an overlap of 50 cm. In addition they are double drilled crosswise.
While assembling the element sections the following segments have to be inserted into the previous segments until the drill holes overlap perfectly. The outer drill hole will be in the vertical position.
Then the 8mm ss screws (the thickest ones) have to be pushed through the drill holes in a way that the screw heads of the outer screws point upwards.
On the opposite side the washers have to be slid over the screw shaft and the self securing nuts have to be screwed on and **tightened solidly** (hold the screw heads with the included tool).
Principally there are **screws of two different lengths** (70 and 55 mm).
The **longer** ones are used to connect the segments 60/55mm, 55/50 and 50/45 mm.
The **shorter ones** are used to connect the segments 45/40 and 40/35 mm (please orientate by the included schematic diagram of the antenna).
Regarding the transition 45/40mm the 70mm long screw has to be used only on the inner horizontal located drill hole.
Concerning the **outer vertical located 45/40mm drill hole** use one of the included extra long screws M8x80mm. Here the **horizontal insulator ring** of the element truss will be fixed later.
In controversy to the above explanation this screw connection has to be realised in a way that the screw shaft points upwards because here the insulator ring of the element truss will be slid on (see fig. 2.4 and 2.7).

2.3.2 SEGMENT TRANSITIONS 35/30, 30/25 and 25/20 mm

On the following three segment transitions the segments have an overlap of 10 cm and they are drilled to each other one time vertically.
While assembling the element sections the following segments have to be inserted into the previous segments with their side which has two drill-holes **equal in size**. The tubes have to be put in until the drill-holes of both segments overlap perfectly. The enlarged drill hole of the previous segment has to point **upwards**.
Then the corresponding ss screws have to be pushed through **from the side of the enlarged drill-hole** of the previous segment.

There are **screws of two different diameters** (6mm and 4mm) and of different lengths.
The **6mm screws** (M6x40) are used for the 35/30 and 30/25mm transition.
The **4mm screws** (M4x30) have to be used on the last 25/20mm transition.
(please orientate by the included schematic diagram of the antenna).
On the opposite side the washers have to be slid over the screw shaft and the self securing nuts have to be screwed on and **tightened solidly** (hold the screw heads with the included special screw-driver against turning, do it carefully, don't break the screws, the screw heads dive into the enlarged drill-hole, see picture page). This method results in an extremely solid mechanical connection and rattle sounds inside the segment overlaps are totally avoided.

By this way of assembling the required lengths of the sections and the element halves are achieved automatically.

While mounting the elements pay attention that all screw heads show **upwards**.

2.3.3 SCREW CONNECTIONS ENDLOADING

Per element half the endloading consists of two 16mm and two 12mm tubes.
The corresponding screws are already pre mounted.

2.4 Assembly of the element sections

We start with the already pre assembled middle section (d = 60mm) which is already fixed onto the element platform.
The following five cross drilled segments (= 55, 50, 45, 40 and 35mm) have to be connected like described at fig 2.3.1.

The **45mm segment** is the one with the main coil, the coil is already inserted into this segment (see picture on picture page).
When inserting this segment into the previous one pay attention that

a. the **longer side has to be pushed into the previous 50mm segment**. So finally, after having installed this segment, left and right of the coil the same amount of 45mm tube has to be seen
b. the screw connections of the coil point downwards (see picture on picture page).

After having fixed this segment the **horizontal ring insulator of the element truss** can be mounted. The truss rope is already fixed to the two corresponding ring insulators by means of a special loop.
The insulator ring has to be inserted in a way that it points upwards towards the element centre (see fig. 2.7 and the photo on the picture page). The insulator ring has to be fixed with a second nut.
When the two ring insulators are mounted on the left and the right side of the element the **element truss rope** will hang slack below the element for the moment.

Into the 45mm segment the 40mm segment has to be inserted and into this the 35mm one (please orientate by the included schematic diagram of the antenna).
Starting with the 35mm segment, as already explained, pay attention that the **enlarged drill holes** of all the following segments point **upwards**.

The next segment has a diameter of 30mm (please orientate by the included schematic diagram of the antenna). Insert it correspondingly into the previous 35mm one.
Then you have to insert the 25mm segments into the 30mm ones and the 20mm segments into the 25mm ones (please orientate by the included schematic diagram of the antenna).
The 20mm segments have seven drill holes, one for the fixation of the following linear loading with an enlarged drill hole on top and six drill holes in the order of two **3-hole-rows**.
This 20mm tube is a standard item which is used on many diverse OptiBeam antennas. Concerning the OB1-80 only the outer 3-hole row is of importance, the inner 3-hole-row has no meaning for this antenna.
The antenna is tuned by us in a way that the centre hole of the outer 3-hole-row has to be chosen (regarding tuning facilities, see fig. 4)

Herewith the straight part of the element is done.

2.5 mounting of the end loading

As already mentioned the OB1-80 is shortened down to its' compact length of 17.60 meters by high Q coils plus by the use of an efficient end loading.

Per element half the end loading consists of two 16mm tubes which run transverse to the element and two 12mm tubes which run in parallel to it.
The 16mm transverse tubes are electrically connected by the 12mm parallel tubes.

The inner 16mm transverse tube is mounted to the 35 mm section of the element by a corresponding plastic tube holder, the outer 16mm transverse tube is electrically connected to the 20mm element segment by a connection strap which jumpers the plastic tube holder.

First slide the outer 16mm transverse tube onto the 20mm element segment (the corresponding tube holder is already pre mounted onto the transverse tube). Mount it **below** the element.

In the same moment connect the **connection strap** which is already fixed to the 20mm element section (see picture on picture pages). Tighten this transverse tube just slightly for the moment.
Now mount the inner 16mm transverse tube **below** the 35mm element section by about 10 cm in front of the 35/30mm transition. To do that open the inserted plastic tube holder and screw it onto the 35mm element segment. This 16mm transverse tube should be **moveable** still.
The two transverse tubes have now to be connected by the 12mm parallel tubes. The 16mm transverse tubes have three drill holes on each side. The 12mm parallel tubes have to be mounted onto the **drill hole on top** of the 16mm transverse.
By moving the inner 16mm transverse tube the correct distance has to be found to connect both transverse tubes by the two 12mm parallel tubes. The parallel tubes have now to be screwed together with the transverse tubes solidly.
Finally the 16mm transverse tubes have to be in parallel to each other and in a right angle to the main element. Then the transverse tubes have to be tightened solidly to the main element by screwing on the screws of the tube holders.
The entire assembly can be seen on the picture pages.

2.6 Installation of the balun

The OB1-80+ is fed through a high quality 2 : 1 balun.

We have already installed the balun onto the top of the element platform.
The balun is directly connected to the CW relais box.

The entire assembly can be seen on the corresponding picture on the picture pages.

2.7 Installation of the centre element truss

Due to reasons regarding stability and optic the element is trussed in the centre by means of a truss facility (see picture on picture pages).
The element truss rope already hangs slack below the element since it was already fixed to the outer element parts by means of the two ring insulators in the moment of the element assembly (see fig. 2.4).

Regarding the usual mounting to a mast now the corresponding pre assembled **mast mounting set** has to be installed to the mast directly above the element platform, momentarily still moveable! This mast mounting set consists of two screws 8x170mm, two stainless steel cradles and corresponding nuts and washers. Slide this set above the mast so that the screw shafts are located above the element platform.
The element truss rope, still hanging below the element, has to be slid over the screw shafts **in between** the big washers which have to be located at the very end of the screw shafts (see picture on picture pages).
The ends of the truss rope are fixed to the ring insulators by means of a special loop (see picture on picture pages). This loop means a continuous exact fastening and simultaneously delivers the possibility for an adjustment of the truss rope at any time.
In case an adjustment is required this loop now can be pushed through the corresponding hole in the ring insulator. The truss rope can be pre tensioned slightly and the loop on the ring insulator can be fixed again.
Long remaining rests of the rope can either be cut off or somehow fixed at the main rope.
Now you have to push the mast mounting set upwards the mast (about one meter) until the element will be straight. Fix the cradles of the mounting set which embrace the mast by means of the two nuts which are located directly at the front cradle.

The truss rope is still moveable over the shafts of the U-bolt in between the two big washers. Take care that the truss rope is equally long on both sides (= that both element halves are equally straight) and finally fix it by means of the nuts in front of the two big washers. The washers will fix the rope without damaging it.

You can adjust the truss rope at any time either by moving the U-bolt on the mast or by changing each half length of the truss on the two outer ring insulators.

Regarding the more seldom installation on a boom use the **truss mast** which will be included in this case. The pre assembled **truss mast** is fixed to two little right angle platforms. These right angle platforms have to be slid below the square bolts of the element platforms. By fixing the platforms to the boom the truss masts will be fixed solidly as well (see picture on picture page).
In the centre of the rope we have already fixed an insulator by means of a special double loop. This insulator now simply has to be inserted **on top** of the truss mast.
Like with the 'mounting to a mast solution' the ends of the truss rope are fixed to a ring insulator each by means of a special loop (see picture on picture pages). This loop means a continuous exact fastening and simultaneously delivers the possibility for an adjustment of the truss rope at any time.
The element now can be brought into the horizontal position (no sag) by tightening the rope on both sides at the ring insulators. For convenience we recommend to first remove the insulator from the truss mast so that the rope is slack again. Now the loop can easily be pushed through the hole of the ring insulator and the rope can be pulled as much as needed. Then the loop has to be fixed again and the insulator has to be reinserted into the top of the truss mast.
Long remaining rests of the rope can either be cut off or somehow fixed at the main rope.
Important: Pay attention that the **hole in the ring insulator where the rope is fixed** points upwards when the rope is under tension.
In case the centre insulator might not be exactly in the middle the double loop can be loosened as well and a fine adjustment can be done.

2.8 Connection of the relay box

By means of the installed relay box the OB1-80+ alternatively can be operated in the SSB-DX or CW-DX frequency range.
As already explained in chapter 2.3 the CW loading coils, mounted to the element platform, alternatively can be switched into function or short cut by the relays which are installed below the elements.

The element is split in the centre by an insulator.
The relay box is attached to this split insulator.
As well the relay box is connected to the loading coils by two pins at the left and the right side of the relay box (regarding tuning facilities, see fig. 4).

A common twin lead which delivers 12 Volts from a source in the shack has to be connected to the pins of the relay box which are labelled with "12V DC".

The twin lead coming from the antenna has to be connected to the delivered **switch box** inside the shack. This switch box has to be connected to a 12 Volt source (range of 12 to about 19 Volts acceptable).
By means of the switch on this box you can choose between the **positions "SSB / high band" and "CW / low band"**.
The position "SSB" represents the current less mode, i.e. the relay on the antenna is closed and the CW loading coils are short cut.
In the position "CW" 12 Volts from the source are delivered into the relay, i.e. it is opened, the CW loading coils are in function and the element is lengthened correspondingly.
At the bottom side of the relay box you will find a **green control light**. This light has to shine in the CW mode.

If the **antenna is not used** keep the switch box in the "SSB" position as this way the relays are not under current all the time.

Attention: never switch while transmitting, only do so in the receive mode!!!

3. Connection of coax cable

The feeding of the antenna has to be done by 50 Ohm coax cable.
For connection a PL-259 connector is required which has to be screwed on to the balun housing. The connector should be sealed against water entry.

4. Adjustment of the antenna

An adjustment of the antenna is not necessary if the given dimensions are exactly observed.
By some influences of the direct surroundings and due to different heights it may happen that the resonance of the antenna (= point of best SWR) shifts slightly.
Or the user wishes a different resonance frequency generally.

4.1 Adjustment in the SSB frequency range

Changes of the resonance frequency (which we have set to 3.790 khz) can be done by **adjustments through the 3-hole rows** of the 20mm segments.
By pushing the 20mm segment in to the last drill-hole of the outer 3-hole row the resonant frequency will be shifted upwards, by pulling the 20m segment out to the first drill-hole of the outer 3-hole-row it will be shifted downwards.
In case slightly bigger changes are required the adjustment has to be done on both element halves (change of resonance frequency by about 30 to 40 khz up or down), in case of slightly smaller required changes the adjustment can be realized just on one side (change of resonance frequency by about 15 to 20 khz up or down).

Attention: Changes in the SSB frequency range will automatically result in a shift of the resonance point in the CW frequency range.
So in case changes on the entire element length are done adjustments have to be made for the CW mode as well even though the frequency coverage might have been perfect before.

4.2 Adjustment in the CW frequency range

In case readjustments of the CW resonance point (point of best SWR which we have pre set on 3.520 khz) are necessary this can be done by changing the amount of coil windings on the CW loading coils (which has no influence on the SSB resonance point).

On the one hand the CW loading coils are fixed electrically and mechanically by diverse aluminium straps to the two side pins of the relay box.
On the other hand they are connected on their **one end solidly** to a plastic spreader and on their **other end variably** by means of a "hand" and a steel ring.

By loosening the counter nut on the **steel ring** the 6mm screw which is screwed into it can be un tightened so that the steel ring can be moved on the coil winding.
In addition the corresponding nuts on the hand have to be unscrewed so that it can be moved like a joint.
After all corresponding parts are loosened the steel ring on the coil winding can be moved in the range of **plus / minus ½ a coil turn**.
By moving it towards the end of the coil the inductivity will be increased and the resonant frequency will be shifted downwards.
By moving it towards the centre the inductivity will be reduced and the resonance frequency will be shifted upwards.

But be careful: the coils react rather sensitive, therefore changes have to be done only by small amounts = few cm.
Likewise note that changes have to be done on each of the coils simultaneously by the same amount.

Important: the antenna is already optimally tuned for both frequency ranges. Changes should only be done if they are absolutely necessary.

5. Position of the antenna at strong winds

At strong winds the antenna should be placed in a way that one **tip** of the element shows **straight into the wind**.
Hereby physical stress to the element is avoided and its' duration is enlarged.

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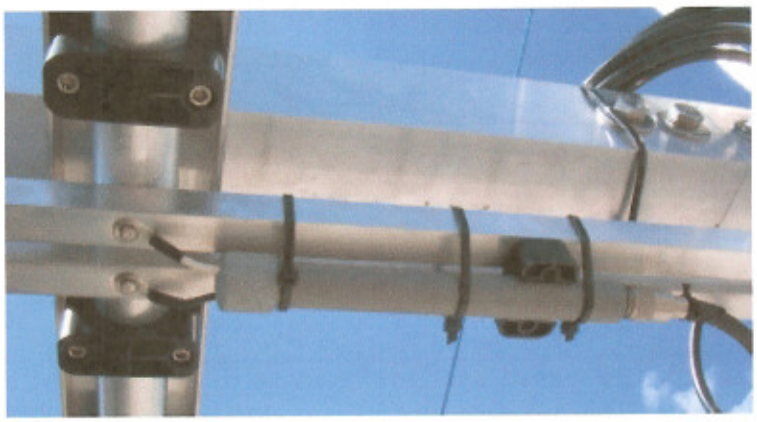
Installation des EB-2-OB Baluns / Installing the EB-2-OB balun



Durch die Verwendung eines hochwertigen 1:1 50 Ohm Baluns am Speisepunkt, wie z.B. des mitgelieferten EB-2-OB, wird die Antenne elektrisch symmetriert und Eigenstrahlung des Koaxkabels wird unterbunden.

Installation

1. Zuerst sind die zwei Schrauben des Strahlerelementes zu entfernen, an dem die Antenne gespeist wird und die auch die Phasenleitungsrohre halten.
2. Der Balun läßt sich gut in der Spalte zwischen den beiden Phasenleitungsrohren befestigen. Er ist mit seinen beiden Anschlußkabeln und den vorher entfernten Strahlerschrauben am Strahler zu befestigen. Dabei sind die Anschlußösen jeweils zwischen zwei U-Scheiben zu schieben.
   Es spielt beim Anschluß keine Rolle, auf welcher Seite das weiße oder schwarze Balun-Anschlußkabel sitzt.
   Lediglich wenn mehrer Yagis in Phase betrieben werden, müssen die Anschlüsse gleichseitig angebracht werden.
3. Das Einschmieren der Balun-Anschlußringe mit einer Konduktionspaste kann den einwandfreien Kontakt zwischen Balun und Element dauerhaft fördern.
4. Der Balun ist mittels der drei Kabelbinder an der Unterseite der Phasenleitungsrohre zu befestigen. Das beigefügte Halbschalenstück ist dabei im vorderen Drittel Richtung SO239 Anschluß zu plazieren, um einen Kontakt zwischen diesem und den Phasenleitungsrohren zu verhindern.
   Die Details gehen aus obigem Photo hervor.
5. Das Koaxkabel ist am SO239 Anschluß des Baluns zu befestigen und sollte hier gegen Wassereindringen geschützt werden (z.B. mit selbstverschweißendem Klebeband oder Silikon).

The antenna is electrically balanced and unwanted radiation of the coax cable itself is prevented by the use of a high quality 1:1 50 ohm balun, such as the EB-2-OB, at the feed point.

Installation

1. Un-screw the two bolts of the driven element where the source is located at and which hold the two square tube transmission lines.
2. The balun will mount below the phase line in the gap between the two phase line tubes close to the main driven element (= feed point). The black and white wire terminals should be attached to the two bolts removed earlier, one on each bolt and washer. ***If you are phasing two or more beams them make sure you attach these wires exactly the same.*** It does not matter where you put the black or white wires since these are balanced output wires from the balun.
3. You may want to put some anti-oxidant paste such as No-Alox, or Penetrox on the terminal connection before you tighten the bolts.
4. Use the three plastic ty-wraps to secure the balun to the transmission line, placing the half tube holder on the connector end as shown in the picture.
5. Attach your feedline jumper to the balun's SO239 connector and weather proof this connection to protect it from water.

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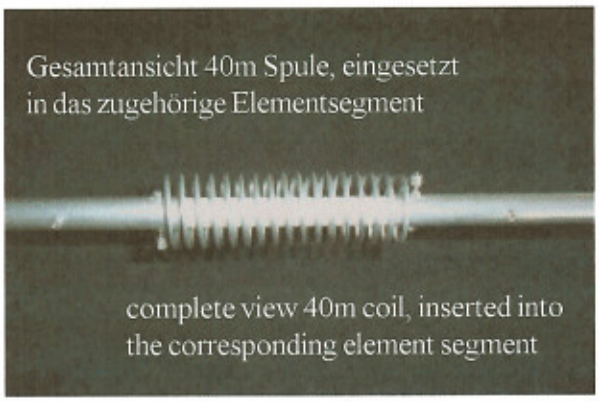

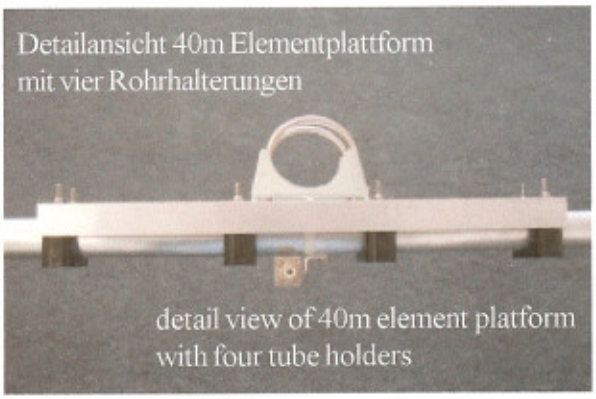

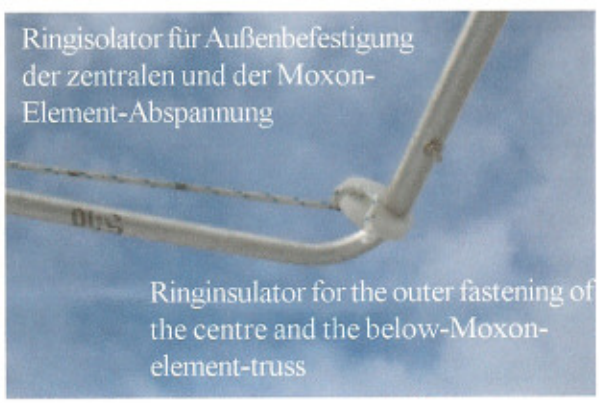

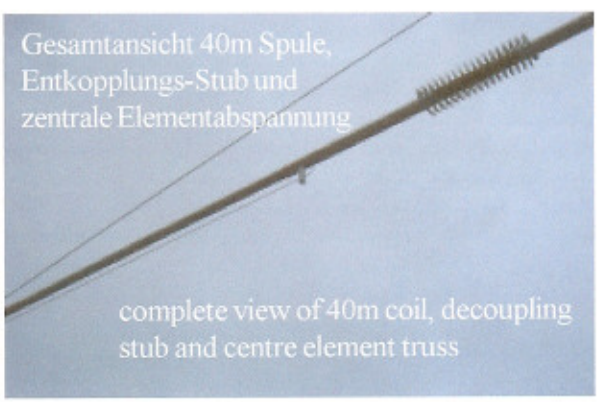

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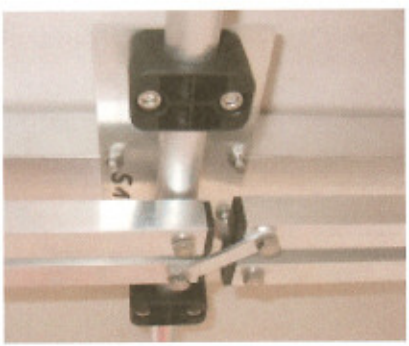
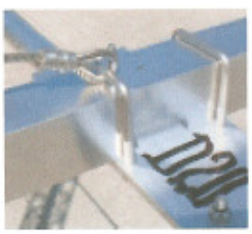
Boom-Masthalterung für kleinere Modelle /
boom to mast mounting for smaller models

Boom-Masthalterung für mittlere Modelle /
boom to mast mounting for medium size models

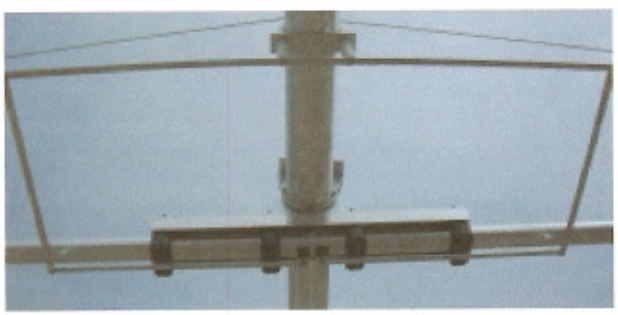
Boom-Masthalterung für große Modelle /
boom to mast mounting for big models



Seitenansicht Überkreuzung Phasenleitung bei Modell 9-5 u. 4-40 /
side view crossing of phase line at model 9-5 and 4-40

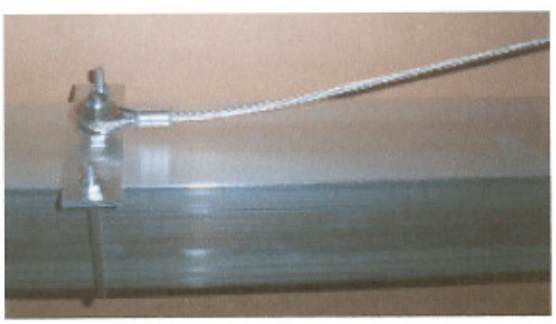


Ansicht zentrale und äußere Boomabspannung für OB11-3 /
view centre and outer boom truss for OB11-3



Gesamtansicht Abschlußstub mit Isolatoraufhängung an Boom bei diversen Modellen /
total view termination stub with insulated fixing to the boom at diverse models

Ansicht variable äußere Boomabspannung div. Modelle /
view variable outer boom truss diverse models



Zentrale Seilabspannung für Modelle über 6 Meter Boomlänge /
centre boom truss for models over 6 meter boom length

Äußere Seilabspannung für große Modelle, Rundboom dto. /
outer boom truss for big models, round boom equivalent

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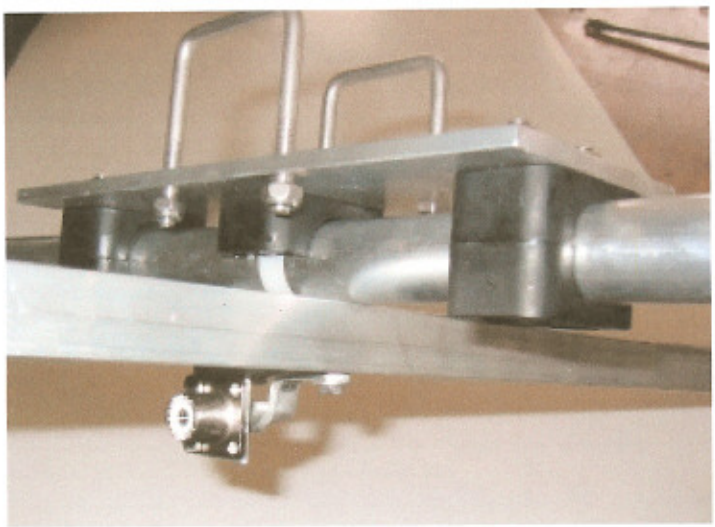
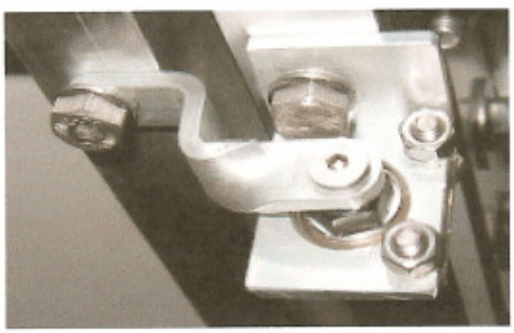
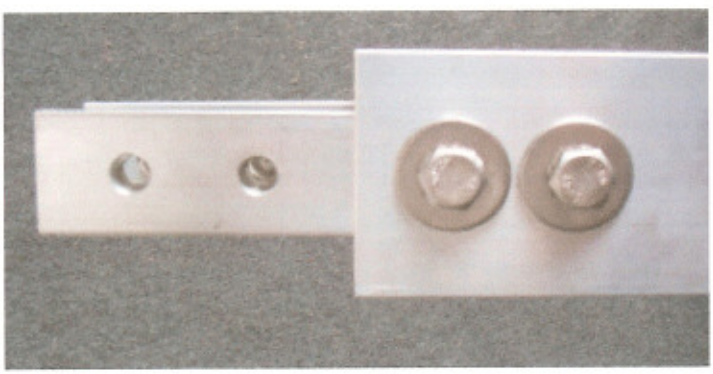


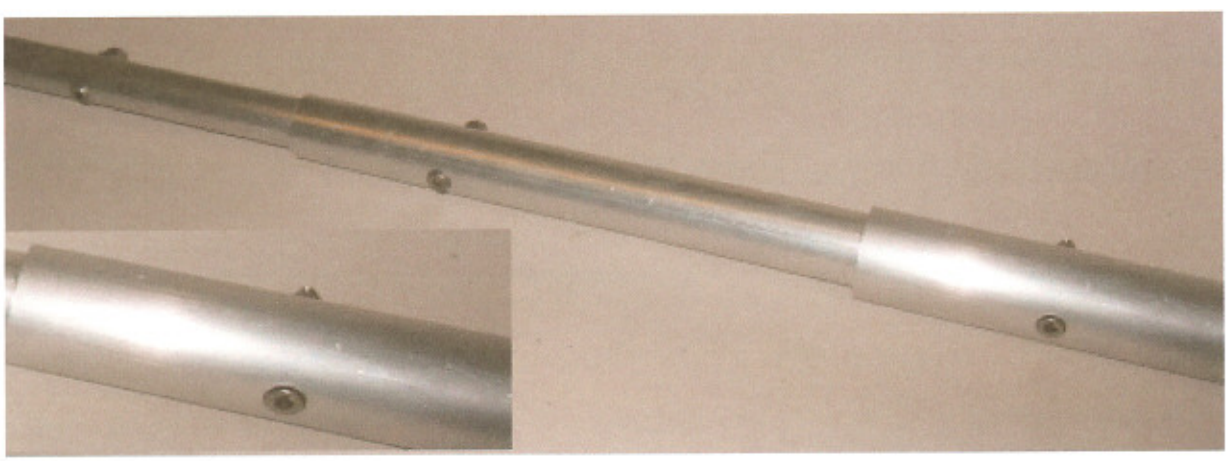
Ansicht Element-Plattform Strahlerelement mit Phasenleitung und Mittenunterstützung / view element platform driven element with phaseline and centre support



Ansicht Koax-Anschlußbuchse SO239 mit Strahlerelement und Phasenleitung /
view coax connector SO239 with driven element and phaseline



Ansicht Boomkopplung bei Vierkantboom /
view boom coupler at square boom



Detailansicht Elementübergänge / close up view element transitions

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