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# OPTIBEAM

**optimale Kurzwellen-Antennen**

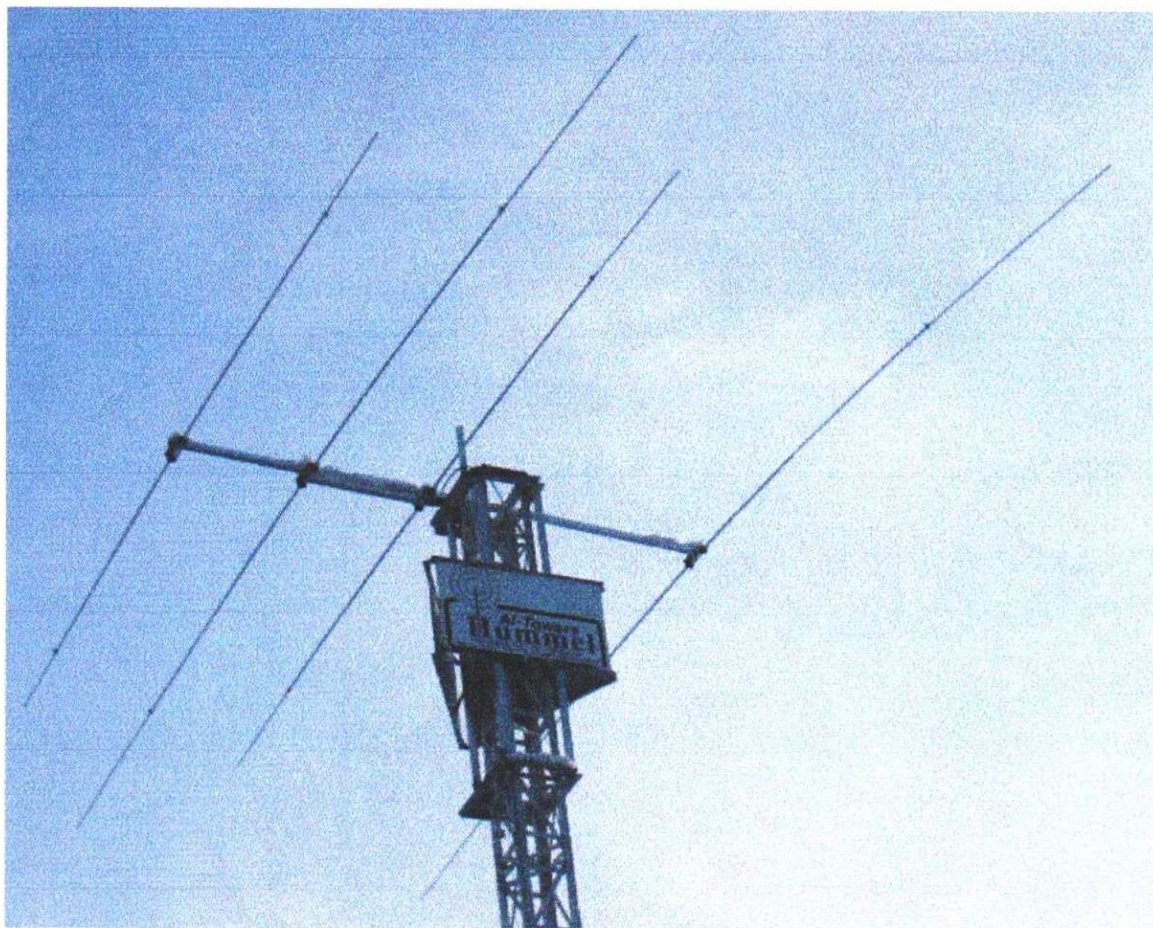
**computer-designed / computer-optimiert**

**entwickelt von Funkamateuren für Funkamateure**

**optimum short-wave antennas**

**computer-designed / computer-optimized**

**developed by hams for hams**



## **O B 4 - 2 WARC**

### **4 Element Yagi 17/12**

***!!! Quality made in Germany !!!***

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## 1. Introduction

The OB4-2WARC is a high performing WARC Duoband Antenna for the 18 and 24 MHz amateur radio bands.

OptiBeam shortwave antennas are designed and optimized by support of modern techniques such as computerized antenna simulation and are finally adjusted by extensive tests in praxis.

The core of the antenna consists of a direct coupled 2-element-drivercell where the drivers are connected with a phase line of square tubes.

There is a separate reflector for each of the two bands. Furthermore there is a reflector for the 17m band and a director for the 12m band.

By this new concept of feeding in combination with a special order of all elements and the exclusive use of full size elements highest efficiency, optimum bandwidth concerning high gain, clear pattern and low SWR together with unlimited power handling are achieved.

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

Bands	17m / 12m
Gain (dbd)*	4,3 / 4,6
Gain (dbi)**	11,9 / 12,5
F/B (db)	15 / 22
SWR: 18,13 24,95	1,1 1,0
Impedance (Ohm)	50
Elements	4
Active elements 17/12	2 / 2
Max. element length (m)	8,52
Boom length (m)	3,50
Weight (kg)	12

- \* = 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 20m above ground

## 2. Assembly

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

- > type of element (R=Reflector, S=Driver, D = Director) and the position on the boom
- > measurements of the element sections (length and diameter)
- > lengths of the element halves
- > distances between the elements.

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

### 2.1 Sorting the parts

The antenna partly consists of already pre assembled parts.

All parts of the antenna are marked.

For faster and easier assembly it is recommended to sort the parts per band.



## 2.2 Assembly of boom

The square boom consists of two parts which have to be assembled by the two coupling pieces that are already installed at one side of the boom. For each coupling piece 4 screws are needed. The screws have to be tightened finally not before the parts of the boom really **fit** to each other perfectly.

## 2.3 Construction of the elements

For the element to boom brackets 4-cornered plates are used and the insulation of the elements is done by 2 (driver platform = 4, see below) special plastic tube holders (see picture page). According to the diameters of the elements there are 2 plates with 25mm (S17 / R17) and 2 plates with 20mm (S12 / D12) tube holders.

The driver element platforms are a bit longer. On them you find a pair of tube holders left and right plus the bottom half of a tube holder in the middle to reinforce the centre of the driven element which is split with the insulator.

The middle sections of the elements have to be fixed **exactly centred** on the plates (orientation = black middle line on parasites / insulator middle piece on driven elements which finally has to sit centred in the pre assembled bottom half of the support tube holder). For that the element middle sections have to be put in to the tube holders (only concerning the driven elements the tube holders at one side have to be opened for this process). Then the screws of the tube holders have to be **tightened solidly**. The screws of the driver middle sections divided with the insulators have to point **straight upwards**.

Next the other element sections have to be assembled. Insert the following sections in the previous sections with their side which has two drill-holes **equal in size**. The tubes have to be put in until the drill-holes of both sections overlap perfectly (concerning the outer 12mm tubes of the driven elements the **middle one** of the three drill-holes has to be chosen).

Then the corresponding screws (25mm tube = longest screw / 20mm tube = mid size screw / 16mm tube = shortest screw) have to be pushed through **from the side of the enlarged drill-hole** of the previous segment. On the opposite side the washers have to be inserted 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, 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 element sections 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**. Keep in mind that the elements hang below the boom. Therefore the screw heads have to be on the same side of the elements where the plates are located at.

## 2.4 Attaching the elements to the boom

The elements fixed on the plates have to be mounted on the **underside** of the boom at the marked positions while the connecting screws of the boom should remain horizontal. The square boom makes a straightening of the elements unnecessary.

The plates are attached to the boom by 2 square brackets which embrace the boom from the top and 4 self securing nuts (see picture page). When tightening the square brackets pay attention that all elements are **parallel** to each other.

The driven elements (from the rear S12, S17) should **not** be tightened **before the installation of the phase line** is done (see fig. 2.5) as they might have to be moved slightly on the boom.

The plates of the outer elements end directly in line with the tips of the boom.



For convenience in general we recommend to assemble all element middle sections to the boom first as well as the phase line (see fig. 2.5) and the coax socket / the balun should be connected to the drivers within this step.

Afterwards the following element sections can be inserted and fixed.

## 2.5 Installation of the phase line

The driven elements (S12, S17) are connected with 2 parallel 20mm square tubes (=phase line).

The square tubes have to be in **direct contact** to the elements (put the washers only below the screw heads). First remove the element screws and washers. Then insert the predrilled square tubes (move the elements slightly if needed) by means of the element screws. Likewise insert the coax connector or the balun at the bottom of the phase line (=elements below boom) directly with the screws of S12 (see picture page). In case the coax connector is used be sure that the screw at the back site of the connector which holds the strap is **tightened solidly**.

Finally the phase line square tubes have to be **tightened really solidly** together with the driven elements (=important electrical contact) and the driven elements have to be mounted below the boom by means of the element plates (see fig. 2.4).

## 2.6 Installation of the boom to mast clamp

The boom-to-mast clamp is a completely pre assembled part (see picture page).

It has to be attached slightly out of the balance point **between R17 and S12 just in front of S12**.

## 3. Connection of coax cable

The feeding of the antenna is done by 50 Ohm coax cable.

For connection a PL-259 connector is required. The connector should be sealed against water entry.

Close to the feed point the cable should be winded to a choke coil with 5 to 6 turns of about 20 cm of diameter. Hereby the antenna is electrically balanced and unwanted radiation of the cable itself is prevented.

Instead of the choke coil a 1:1 balun can be used as well (not within the standard .delivery scale, but recommended).

## 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 it may happen that the resonance of the antenna (=point of best SWR) shifts on one or several bands.

By minimum changes of the according driver lengths (=shortening or lengthening of the outer 12mm sections) the resonant frequency of the according band can be shifted to the desired point.

By a slight decrease of the lengths of both element halves (put outer section in to the last drill-hole) the resonant frequency will be shifted upwards, by an increase (pull final section out to the first drill-hole) it will be shifted downwards.

Normally these adjustments don't have to be done as the antenna does not react very sensitive against influences of the surroundings and the SWR curve is flat anyway.

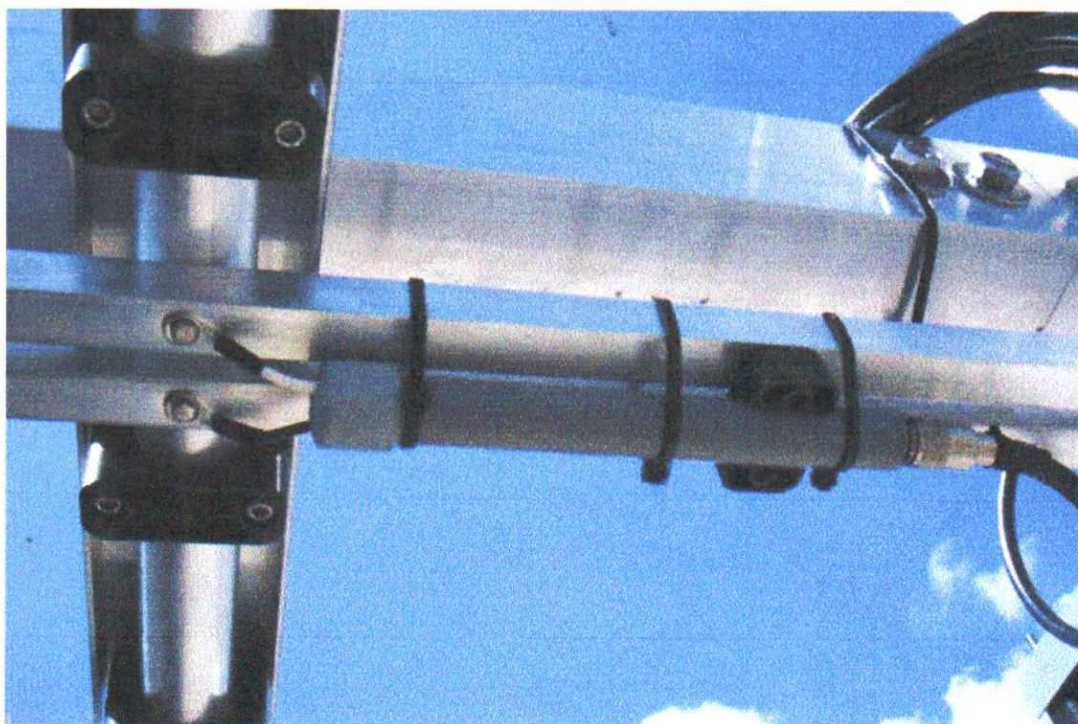
## 5. Position of the antenna at strong winds

At strong winds the antenna should be placed in a way that the tips of the elements **show straight into the wind** which means that the boom stands broadside to it.

Hereby physical stress to the full size elements is avoided and their duration is enlarged.



## 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 beigegefügte 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.





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



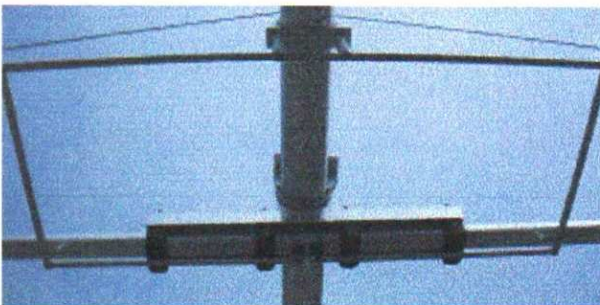
Seitenansicht Überkreuzung Phasenleitung bei Modell 9-5 u. 4-40 /  
 side view crossing of phase line at model 9-5 and 4-40



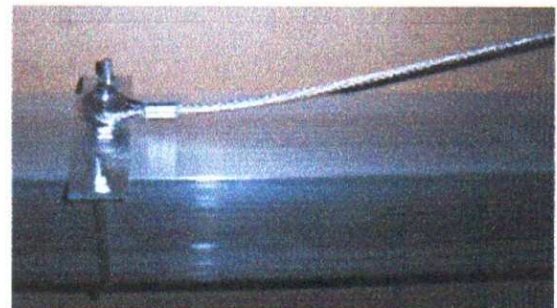
Ansicht zentrale und äußere Boomabspannung für OB11-3 /  
 view centre and outer boom truss for OB11-3



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



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



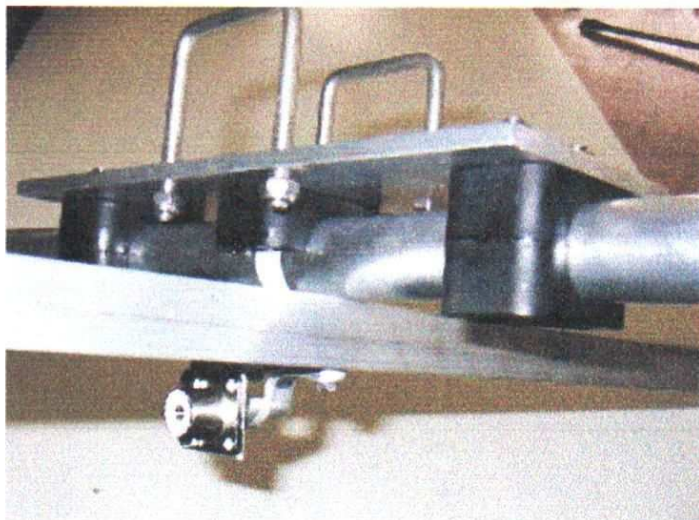
Äußere Seilabspannung für große Modelle, Rundboom dto. /  
 outer boom truss for big models, round boom equivalent



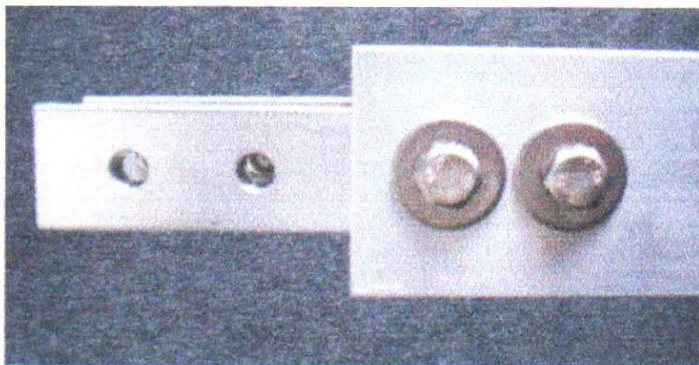
Zentrale Seilabspannung für Modelle über 6 Meter Boomlänge /  
 centre boom truss for models over 6 meter boom length





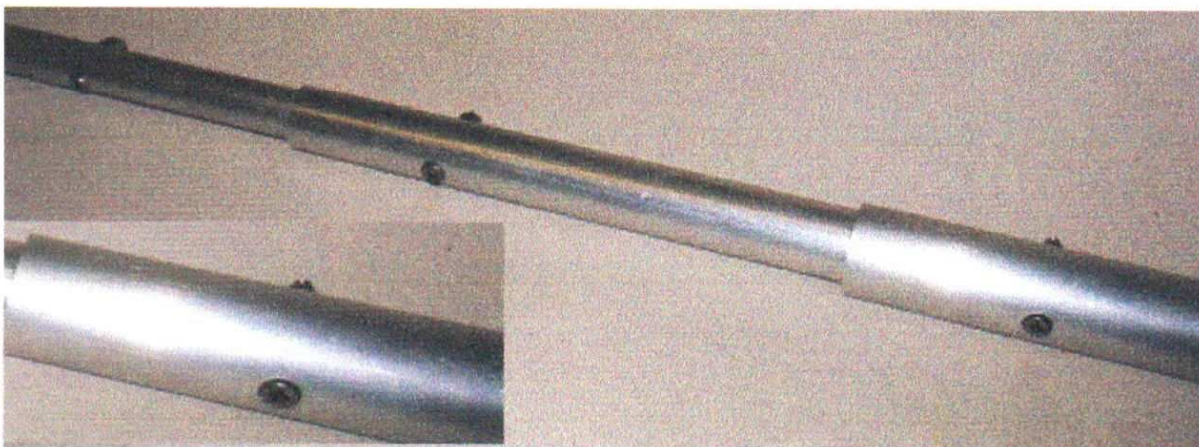


Ansicht Element-Plattform Strahlerelement  
mit Phasenleitung und Mittenunterstützung /  
view element platform driven element with  
phaseline and centre support



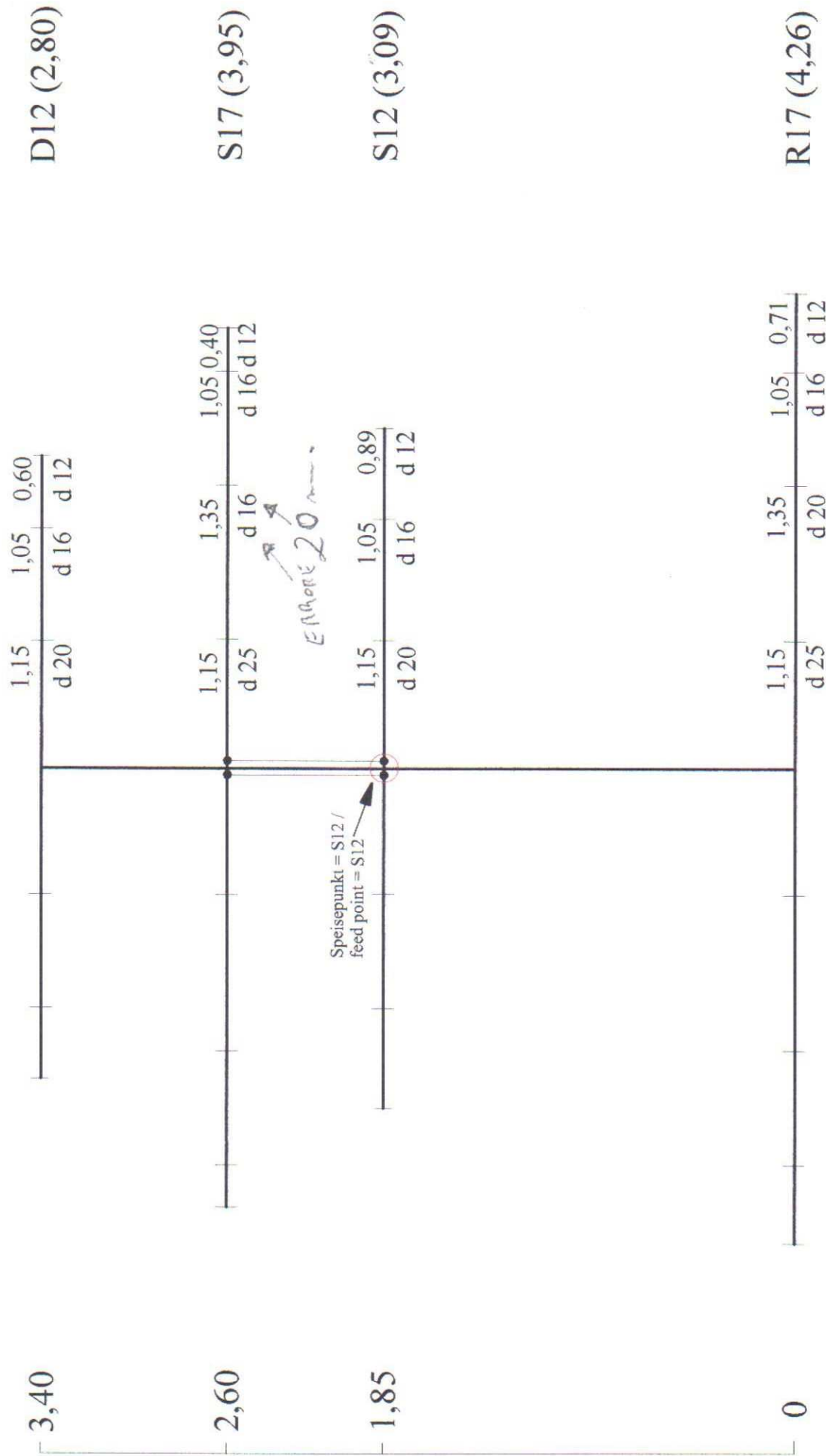
Ansicht Koax-Anschlußbuchse SO239 mit Strahler-  
element und Phasenleitung /  
view coax connector SO239 with driven element  
and phaseline

Ansicht Boomkopplung bei Vierkantboom /  
view boom coupler at square boom



Detailansicht Elementübergänge / close up view element transitions

# OptiBeam OB4-2W ARC



alle Längenmaße in m ; alle Durchmesser in mm