windtest
grevenbroich gmbh

Checking 3600 mm and 5400 mm booms on conformance according to IEC 61400-12-1 Ed. 1

2013-03-08

SO 13005 KB1

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Checking 3600 mm and 5400 mm booms on conformance according to IEC 61400-12-1 Ed. 1

report SO 13005 KB1

Location or measuring site:	

Client:	TELECONTRACTING SCANDINAVIA AB Stranvägen 169 S-59146 Motala

Contractor:	windtest grevenbroich gmbh Frimmersdorfer Straße 73a D-41517 Grevenbroich

Date of order:	2013-01-02	**Contract number:**	13 0028 09

Checked by:	Prepared by:
Dipl.-Ing. Frank Albers	Dipl.-Ing. Bernd Maaßen

Grevenbroich, 2013-03-08

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1 Introduction

The work sheet from windtest grevenbroich gmbh was to check the 3600 mm and 5400 mm booms from company Telecon (S) on conformance according to IEC 61400-12-1 Ed. 1. This work sheet is to be carried out on behalf of TELECONTRACTING SCANDINAVIA AB, represented by Mr. Lars Laurin.

The evaluation of the work sheet was carried out by Dipl.-Ing. Bernd Maaßen, an employee of windtest grevenbroich gmbh (wtg). The statement regarding to the conformity of the booms refers to the information given at the time of the evaluation. The following documents were provided by TELECONTRACTING SCANDINAVIA AB:

- CD 431100 MARKET- måttsatt sektion.pdf (date: 12.06.2008, 14:12)
- CD 431170 Market.pdf (date: 27.01.2011, 14:04)
- Design verification K-600 Strong.pdf (date: 12.02.2013, 09:19)
- K-600 Strong.doc (date: 22.09.2010, 12:24)
- Required anemometer distance to centre of mast.doc (date: 15.06.2011, 15:07)
- Structure components K 600 Sektion.doc (date: 02.01.2013, 10:22)
- Telecon folding boom 3600mm revB.pdf (date: 14.06.2011, 10:42)
- CD 455020.pdf (date: 16.05.2011, 17:29)
- Telecon folding boom 5400mm revB.pdf (date: 15.06.2011, 07:31)

1.1 Met mast K-600

This met mast is a quadratic lattice met mast from company Cue Dee (S). The type of the mast is K-600 with a centre distance between the legs of the mast structure of 600 mm (see figure 1) and a solidity of 0.231 (see “Required anemometer distance to centre of mast.doc”).

Each mast section has a length of 2000 mm.

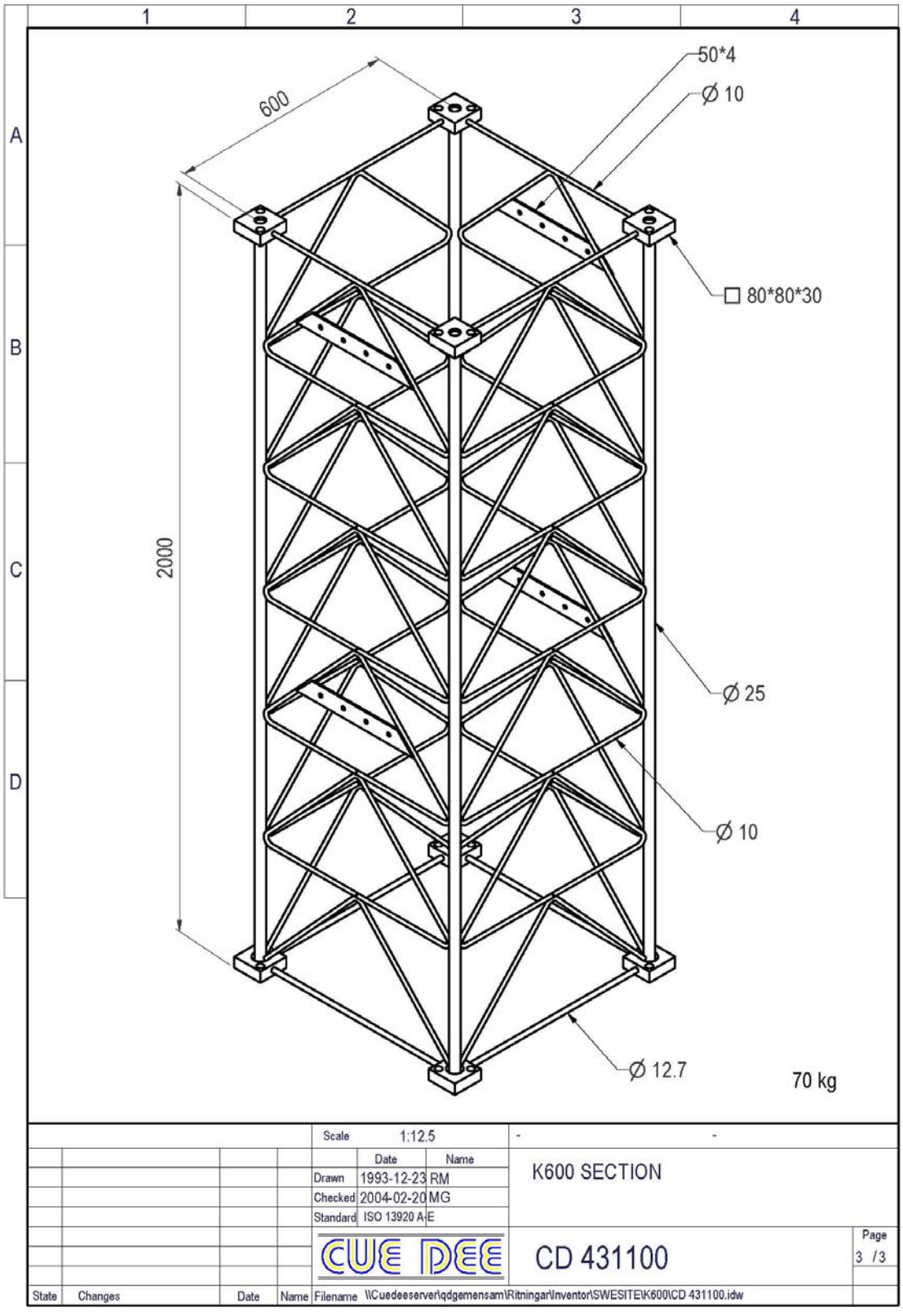

figure 1: mast section K-600

1.2 Met mast K-600 STRONG

This met mast is a quadratic lattice met mast from company Cue Dee (S). The type of the mast is K-600 STRONG with a centre distance between the legs of the mast structure of 600 mm (see figure 2) and a solidity of 0.2509 (see “K-600 Strong.doc”).

Each mast section has a length of 2000 mm.

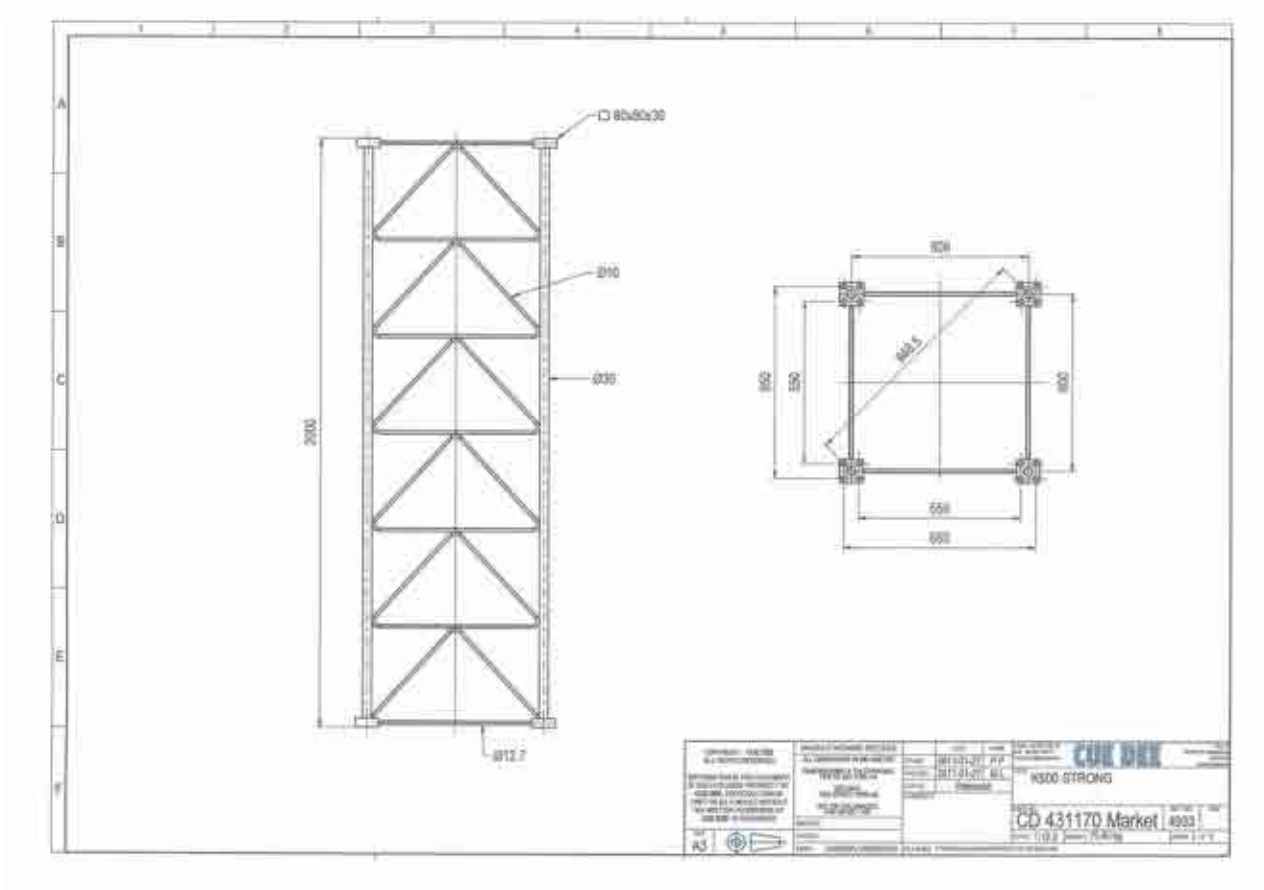

figure 2: mast section K-600 STRONG

1.3 Boom 3600 mm for met mast K-600 or K-600 STRONG

The boom to be checked on conformity according to IEC 61400-12-1 Ed. 1 is a folding boom from company Telecon (S) with a length of 3600 mm (see figure 3) and a horizontal tube with a diameter of Ø 50 mm. The vertical tube at the end of the boom has a length of 780 mm and a diameter of Ø 35 mm. The sensors will be mounted on the vertical tube. The boom is stabilized by one support wire with a diameter of Ø 3 mm above the boom and one boom support with a diameter of Ø 25 mm below the boom. The influence of the support wire due to flow distortion can be neglected. The perpendicular distance of the boom support to the next installed sensor below shall be greater than 25 times the boom support diameter. Then the boom support has no significant influence on the sensor due to flow distortion.

The booms shall be mounted perpendicular to the centre of the measurement sector if the measurement sector is 90° or less to get minimum distortion on the anemometer.

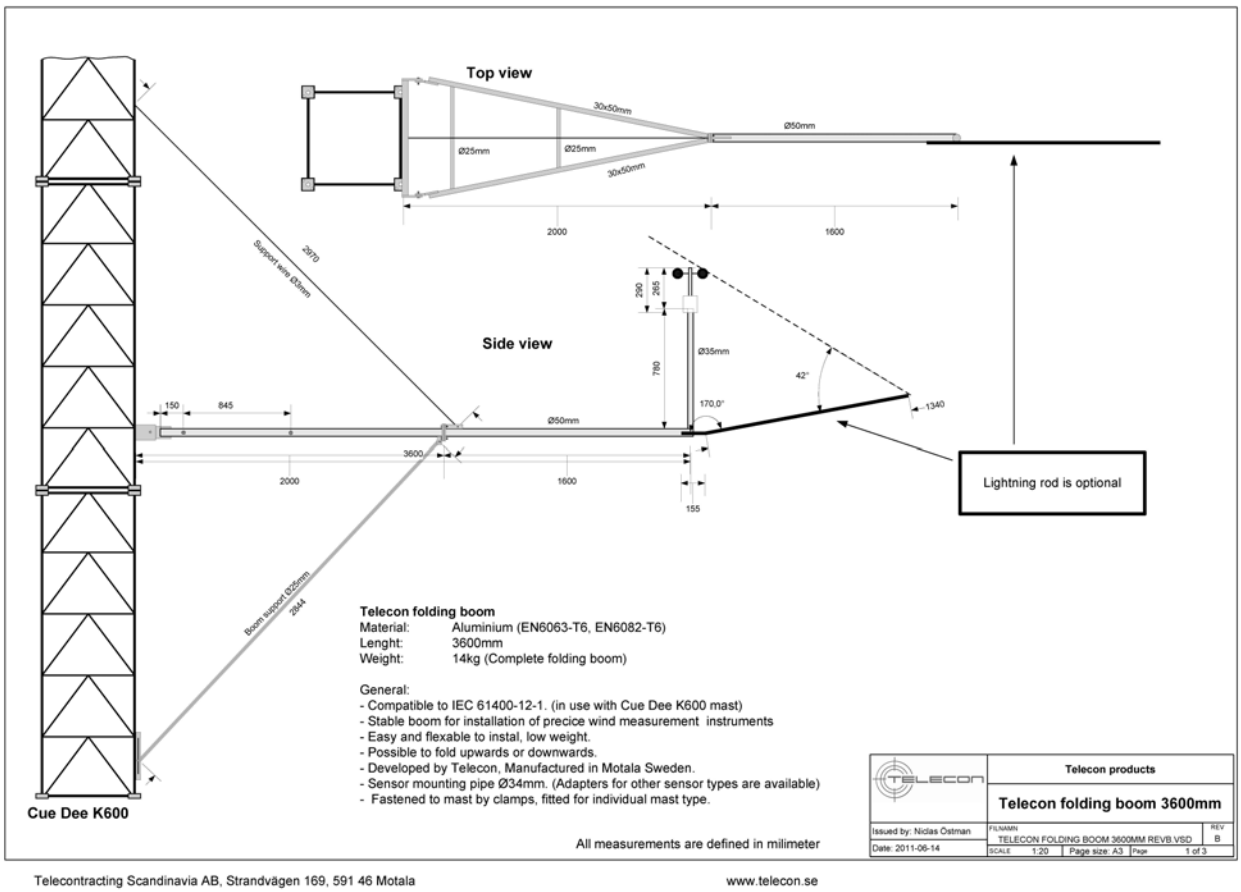

figure 3: folding boom 3600 mm

1.4 3600 mm boom check on conformance according to IEC 61400-12-1 Ed. 1

There are two main criteria for a boom to be conformance according to IEC 61400-12-1 Ed. 1. The first is the necessary horizontal distance between met mast and anemometer to minimize the flow distortion of the anemometer due to mast influences. The second is the necessary vertical distance between boom and anemometer to minimize the flow distortion of the anemometer due to boom influences.

To minimize the mast influence wtg considers the edge condition of a centre-line wind speed deficit of 99.5 %. For the K-600 met mast this results in a distance between anemometer and mast centre of 3235 mm (for a square cross-section mast with round members) for the K-600 Strong met mast this results in a distance between anemometer and mast centre of 3366 mm (for a square cross-section mast with round members) (see IEC 61400-12-1 Ed. 1, equation G.2). The horizontal boom length with 3600 mm is in compliance with the above described criteria.

To minimize the boom influence the anemometer cups must be mounted at least 15 times the boom diameter above the boom but 25 times the boom diameter is recommended. The vertical distance between boom and anemometer cups must be at least 750 mm but 1250 mm is recommended. As an example the vertical distance between anemometer cups for a Thies First Class anemometer which is one of the class A anemometers and the boom is 1005 mm. The vertical boom length is conformance according to the above described criteria.

1.5 Met mast K-1050/60

This met mast is a quadratic lattice met mast from company Cue Dee (S). The type of the mast is K-1050/60 with a centre distance between the legs of the mast structure of 1050 mm (see figure 4) and a solidity of 0.220 (see “Required anemometer distance to centre of mast.doc”).

Each mast section has a length of 2000 mm.

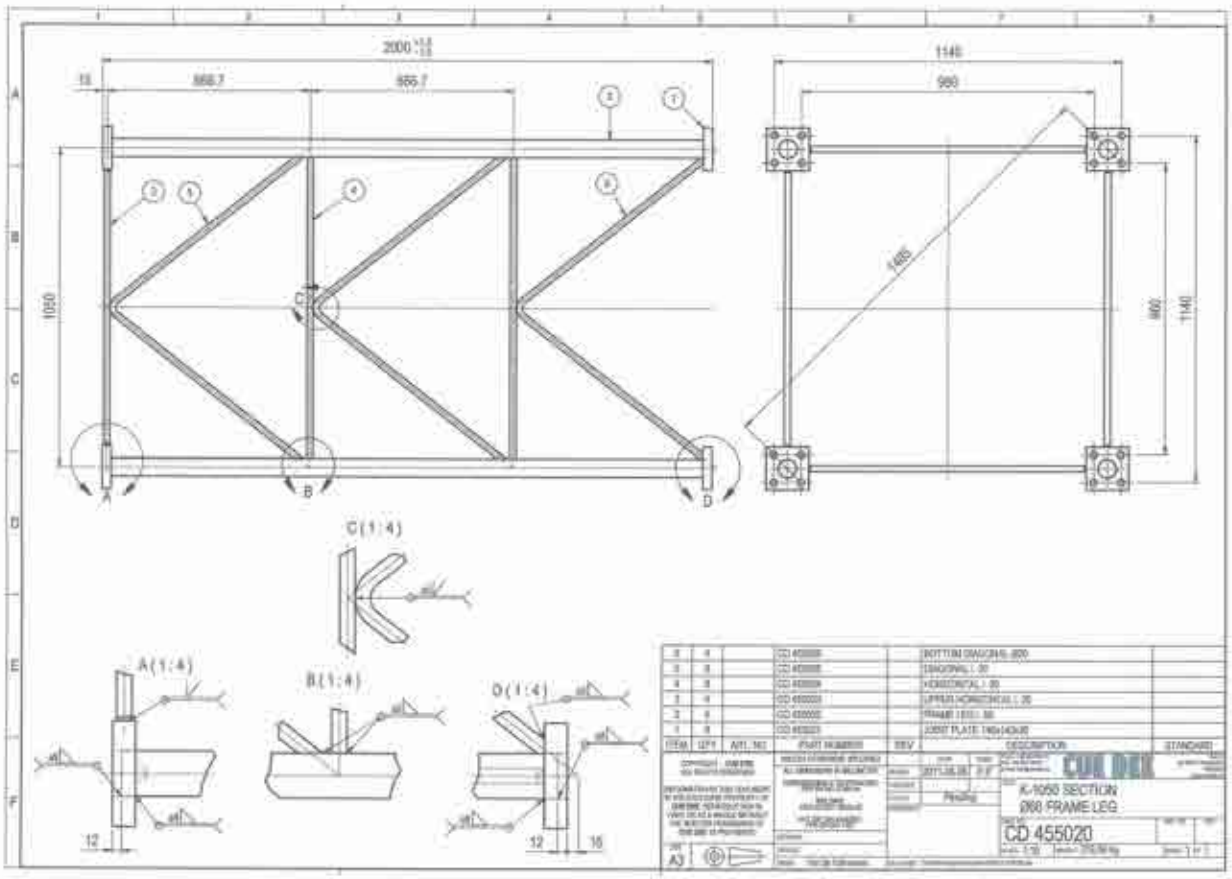

figure 4: mast section K-1050/60

1.6 Boom 5400 mm for met mast

The boom to be checked on conformity according to IEC 61400-12-1 Ed. 1 is a folding boom from company Telecon (S) with a length of 5400 mm (see figure 5, figure 6) and a horizontal tube with a diameter of Ø 50 mm. The vertical tube at the end of the boom has a length of 780 mm and a diameter of Ø 35 mm. The sensors will be mounted on the vertical tube. The boom is stabilized by three support wires with a diameter of Ø 3 mm (two above the boom and one below the boom) and one boom support with a diameter of Ø 30 mm below the boom. The influence of the support wires due to flow distortion can be neglected. The perpendicular distance of the boom support to the next installed sensor below shall be greater than 25 times the boom support diameter. Then the boom support has no significant influence on the sensor due to flow distortion.

The booms shall be mounted perpendicular to the centre of the measurement sector if the measurement sector is 90° or less to get minimum distortion on the anemometer.

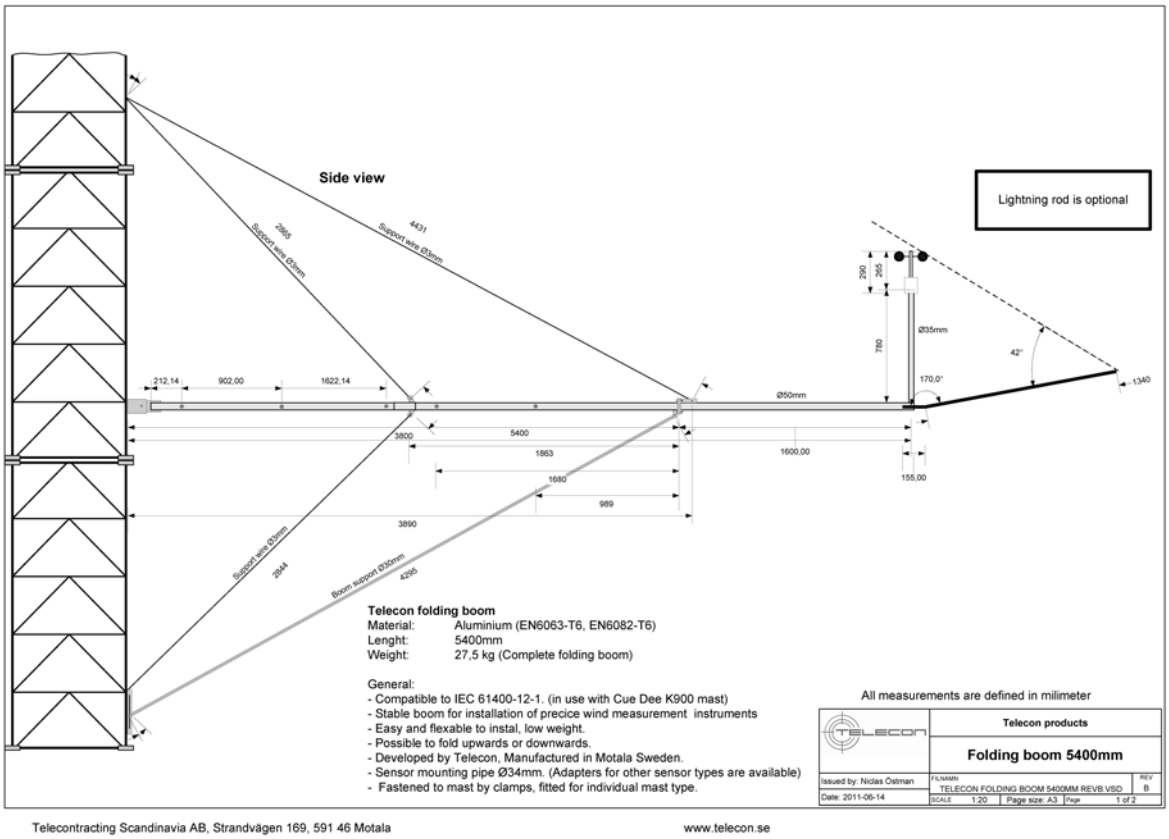

figure 5: folding boom 5400 mm (side view)

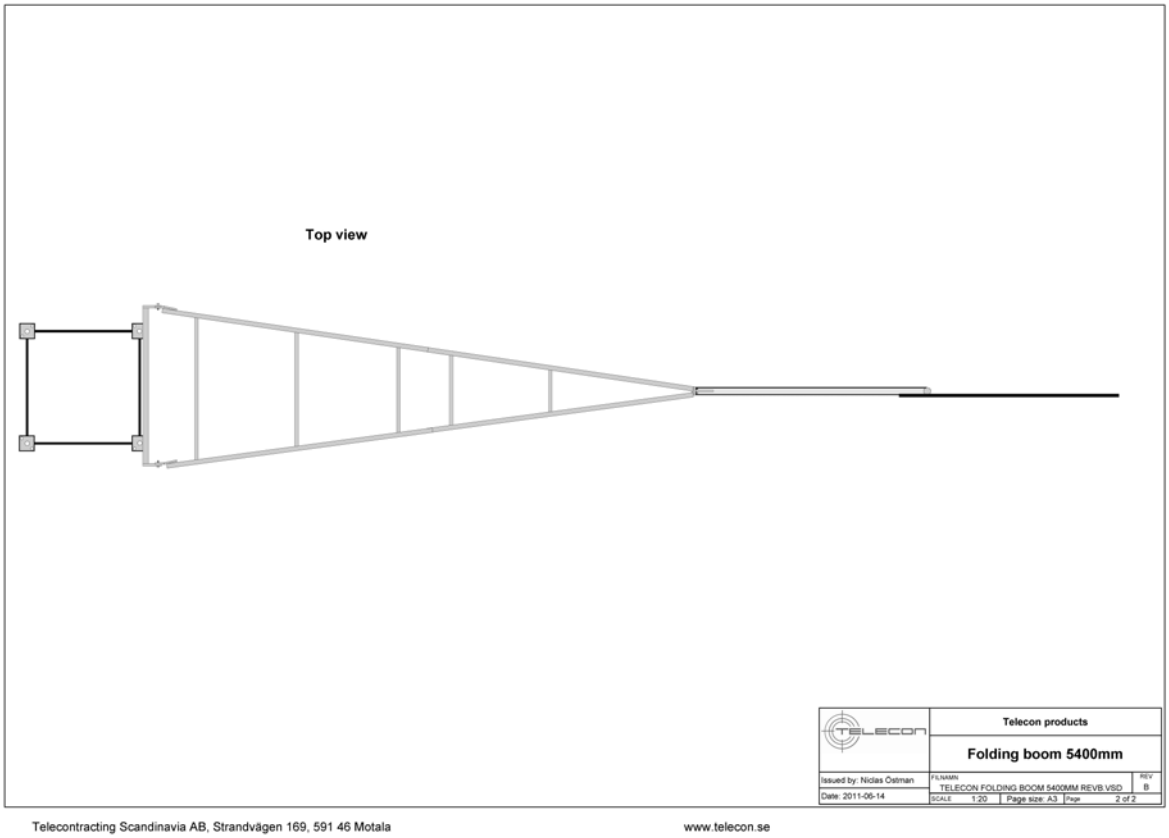

figure 6: folding boom 5400 mm (top view)

1.7 5400 mm boom check on conformance according to IEC 61400-12-1 Ed. 1

There are two main criteria for a boom to be conformance according to IEC 61400-12-1 Ed. 1. The first is the necessary horizontal distance between met mast and anemometer to minimize the flow distortion of the anemometer due to mast influences. The second is the necessary vertical distance between boom and anemometer to minimize the flow distortion of the anemometer due to boom influences.

To minimize the mast influence wtg considers the edge condition of a centre-line wind speed deficit of 99.5 %. For the K-1050 met mast this results in a distance between anemometer and mast centre of 5523 mm for a square cross-section mast with round members (see IEC 61400-12-1 Ed. 1, equation G.2). The horizontal boom length with 5400 mm is in compliance with the above described criteria.

To minimize the boom influence the anemometer cups must be mounted at least 15 times the boom diameter above the boom but 25 times the boom diameter is recommended. The vertical distance between boom and anemometer cups must be at least 750 mm but 1250 mm is

recommended. As an example the vertical distance between anemometer cups for a Thies First Class anemometer which is one of the class A anemometers and the boom is 1005 mm. The vertical boom length is conformance according to the above described criteria.

2 Findings

The 3600 mm and 5400 mm booms are conformance according to IEC 61400-12-1 Ed. 1.

The check on conformance according to IEC 61400-12-1 Ed. 1 is only suitable for the information given in this report. Should the boom dimensions change the items must be re-checked.

The report applies only to the mast and booms described in chapter 1.1, 1.2, 1.3, 1.5 and 1.6.

We declare that this report was prepared according to the state of the art, objectively and to the best of our knowledge and belief.

Grevenbroich, 2013-03-08

Dipl.-Ing. Bernd Maaßen

Stamp