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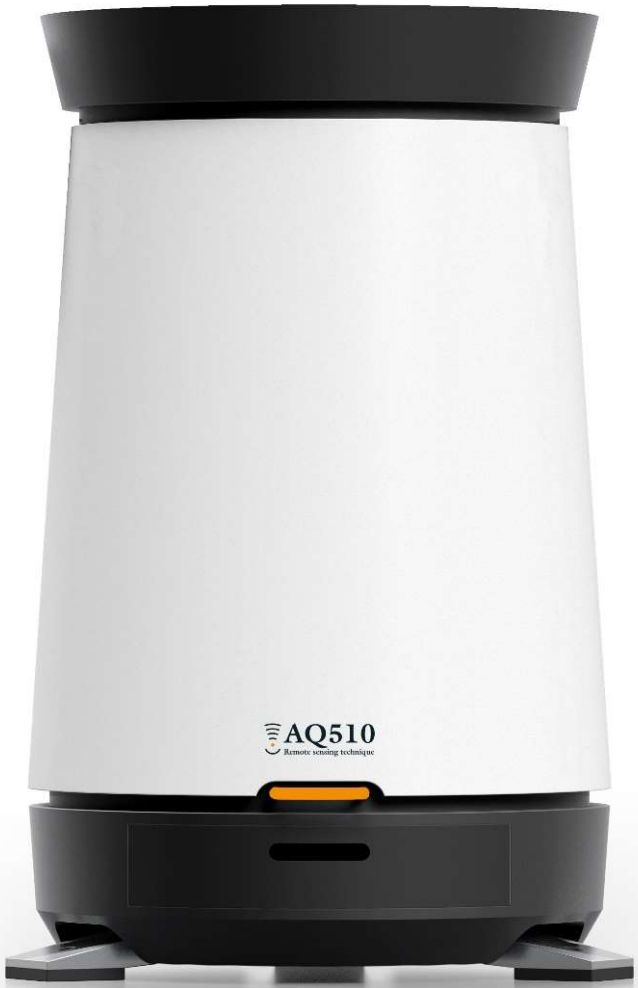
Remote sensing technique

ADVANCED REMOTE SENSING TECHNOLOGIES



reddot award
winner

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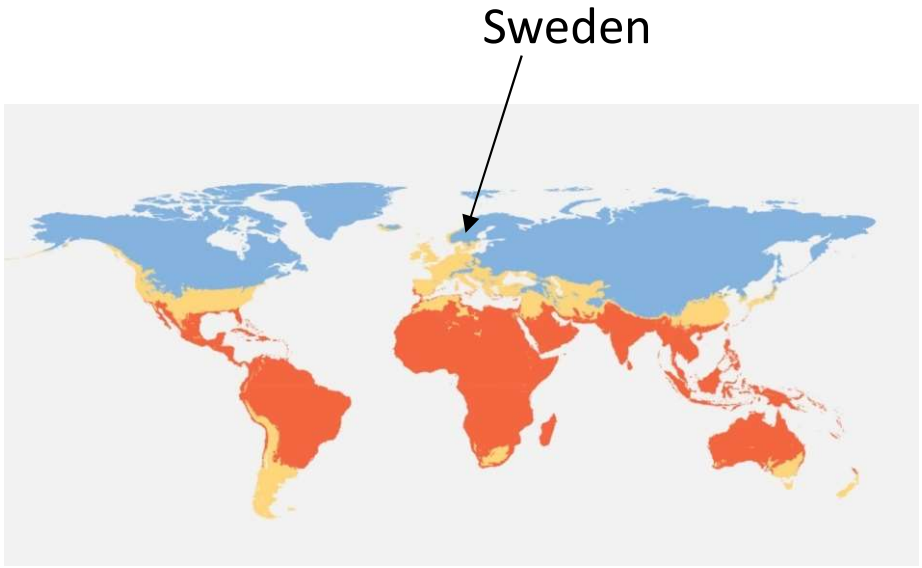
ABOUT AQSYSTEM

- AQSystem founded 1989
- Private company
- Location of head office in near Stockholm, Sweden
- Development, Production & Sales
- Advanced Remote Sensing Technologies - AQ510
- Off Grid Power Solutions - AQPower



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HISTORY OF SoDAR

- SoDAR – Sonic Detection And Ranging
- Technology originally developed by Swedish military in 1960s
- Founder of AQSystem developed SoDAR and LiDAR in1970s
- AQ500 Wind Finder released in 2006 for the wind industry
- AQ510 second generation became fully commercial in 2015

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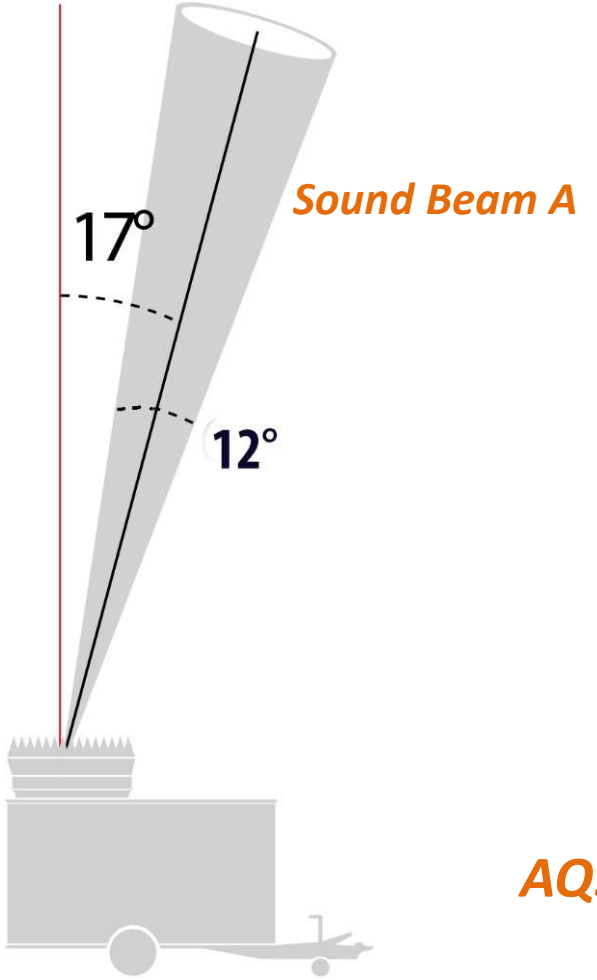
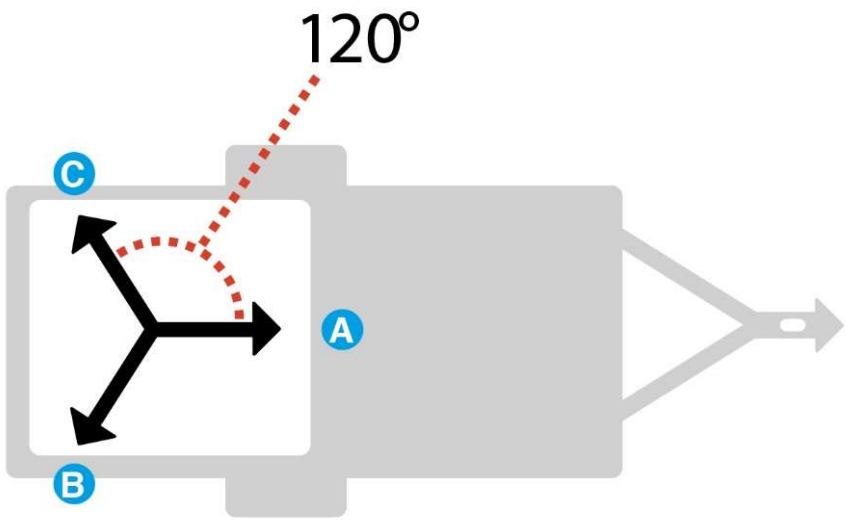
HOW DOES IT WORK?

- Sound pulses transmitted in three directions
- Reflected by small temperature variations in atmosphere
- Difference between transmitted and received frequency is used for wind calculation





AQ510 in trailer.

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DATA IN ALL CONDITIONS

- High data availability
- High data quality
- Works in rain
- Works in low temperatures
- Works in snow
- Works in fog
- Works in clean air (no aerosols)

"We use the AQSystem SODARS in a number of projects and are impressed with the high data availability and robustness of the unit. With an average data availability of 97% at 100m, it is the remote sensing product with the highest data availability we have ever installed." Rafael Zubiaur, CEO of Barlovento Recursos naturales

barlovento
recursos naturales

AQ510 CW in Norway

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ECONOMICAL

- Low purchase price
- Low cost of ownership
- No recurring service fees
- Calibrated in field

”We consider the AQSystem SODARS a very useful tool for wind site assessments. In our most recent project, we used altogether three units in parallel with a met mast and were thus able to run simultaneous measurements at four separate points for a period of four months. As a result we were able to raise the project’s P90 value with several percent.” Måns Håkansson, PhD, Wind & Site at Statkraft

Statkraft

AQ510 WW with trailer

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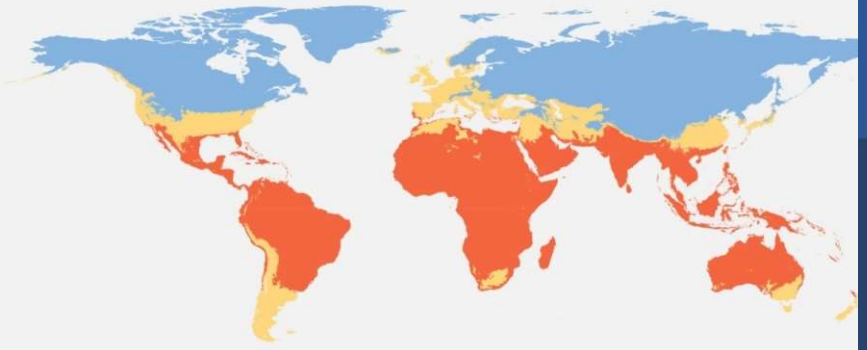
GLOBAL DEPLOYMENTS

GO WHEREVER THE WIND BLOWS

With our power pack and heating options, the AQ510 gives you a cost effective solution for any climate and any site. Below is a general recommendation, but local conditions can require different solutions.

		230-120VAC or 12-24VDC	SOLAR PANELS	DIESEL GENERATOR	FUELCELL	AQWEBVIEWER	DIESEL HEATER	OPTIONAL TRAILER
AQ510 Instrument only		●				●		
AQ510 CW	Cold winter kit		●	●		●	●	●
AQ510 MW	Mild winter kit		●		●	●	●	●
AQ510 WW	Warm winter kit		●			●		●



- Configurations for every environment
- Approximately 4 000 Deplyments
- Used in 5 continents
- 350 Performed Calibrations

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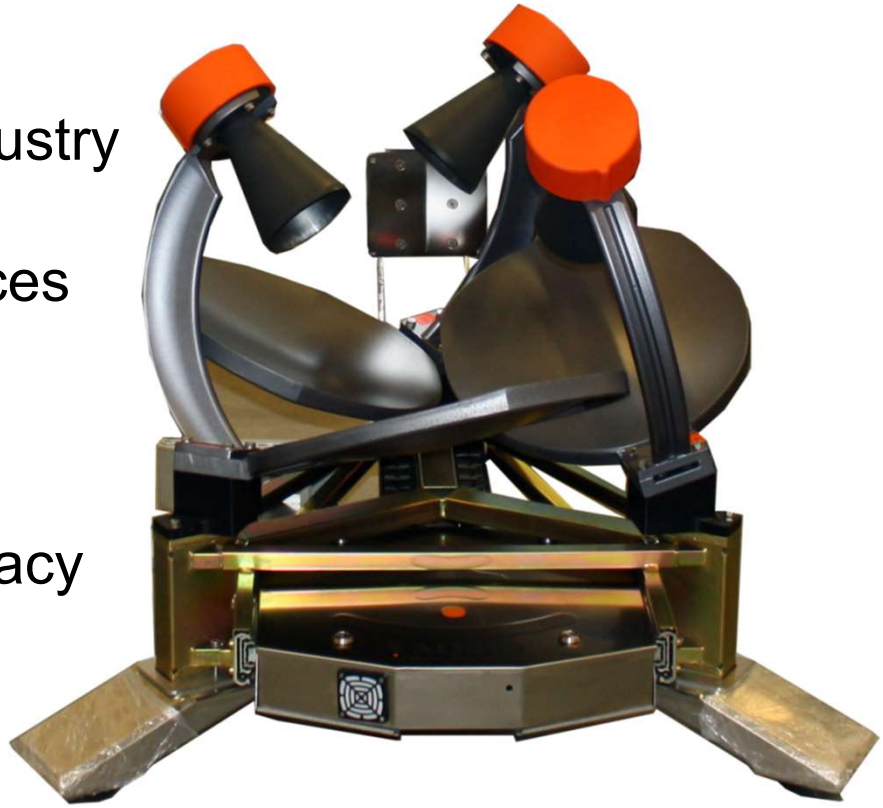
AQ510 – SECOND GENERATION

"AQSystem SODAR and 80 m mast is current RES standard practice in Scandinavia The AQ510 is a very good device: Robust and provides data in all weather conditions. Reliable with excellent operational availability (> 98 %)." Iain Campbell, MInstP, RES Group

res
power for good

- AQ510 system designed for the wind industry
- High quality and tight production tolerances
- Excellent unit-to-unit conformity
- Proven and independently verified accuracy
- No recurring support charges



AQ510 Speaker and Electronics Assembly

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KEY FEATURES

"We currently have 37 AQS SODARs deployed in various measurement campaigns in Sweden and elsewhere in Europe. Due to their mobility and high data availability, we see them as a useful tool in our measurements campaigns." Daniel Gustafsson, Project Manager at Vattenfall

VATTENFALL

- Wind speed range 0 to 40m/s
- High data availability
- High resolution - 52 measurement heights from 40m to 300m
- Compact and modular design
- Integrated GPS
- Power and heating options to suit all climates
- Fixed geometry and parabolic dishes

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NEWA

NEWA, New European Wind Atlas based on AQ510 Wind Data

PHILOSOPHICAL TRANSACTIONS A

rsta.royalsocietypublishing.org

Research

Cite this article: J. Mann *et al.* 2017 Complex terrain experiments in the New European Wind Atlas. *Phil. Trans. R. Soc. A* **375**: 20160101. http://dx.doi.org/10.1098/rsta.2016.0101

Accepted: 23 November 2016

One contribution of 11 to a theme issue 'Wind energy in complex terrains'.

Subject Areas:
atmospheric science, meteorology, energy, fluid mechanics

Keywords:
complex terrain, meteorological experiment, Doppler lidar

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Complex terrain experiments in the New European Wind Atlas

J. Mann[1], N. Angelou[1], J. Arnqvist[2], D. Callies[3], E. Cantero[4], R. Chávez Arroyo[4], M. Courtney[1], J. Cuxart[8], E. Dellwik[1], J. Gottschall[3], S. Ivanell[2], P. Kühn[3], G. Lea[1], J. C. Matos[5], J. M. L. M. Palma[6], L. Pauscher[3], A. Peña[1], J. Sanz Rodrigo[4], S. Söderberg[7], N. Vasiljevic[1] and C. Veiga Rodrigues[6]

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[4]National Renewable Energy Centre (CENER), Sarriguren, Spain
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[6]Faculdade de Engenharia da Universidade do Porto (FEUP), Porto, Portugal
[7]WeatherTech Scandinavia AB, Uppsala, Sweden
[8]Universitat de les Illes Balears, Mallorca, Spain

JM, 0000-0002-6096-611X; JA, 0000-0002-5443-3173; LP, 0000-0003-3096-5674

The New European Wind Atlas project will create a freely accessible wind atlas covering Europe and Turkey, develop the model chain to create the atlas and perform a series of experiments on flow in many different kinds of complex terrain to validate the models. This paper describes the experiments of which some are nearly completed while others are in the planning stage. All experiments focus on the flow properties that are relevant for wind turbines, so the main focus is the mean flow and the turbulence at heights between 40 and 300 m. Also

THE ROYAL SOCIETY PUBLISHING

AQ510 MW & 180m Met mast

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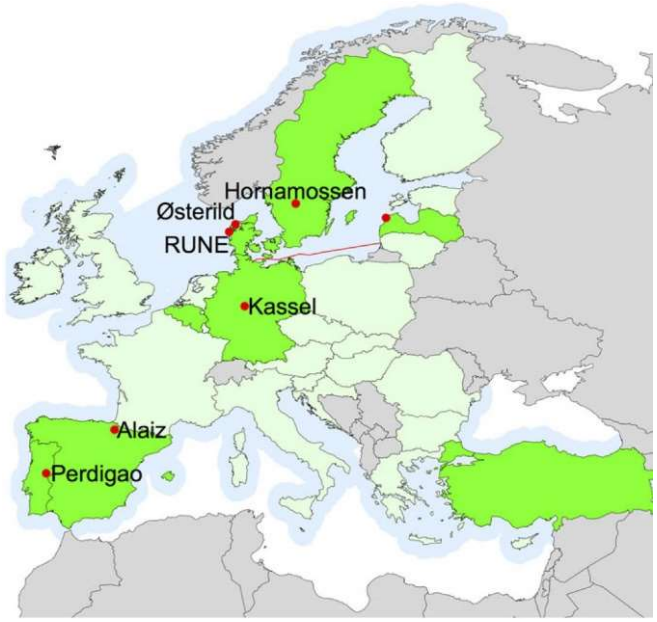
NEWA

- NEWA, New European Wind Atlas based on AQ510 Wind Data



- ✓ Is the AQ510 measuring correct wind and turbulence on higher altitudes= Yes
- ✓ Can the AQ510 be used in forest terrain= Yes
- ✓ Can the AQ510 measure correctly in different atmospheric stabilities= Yes
- ✓ Can the AQ510 measure correctly in complex terrain= Yes

http://rsta.royalsocietypublishing.org/content/375/2091/20160101

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UNIQUE TO AQ510

- Every AQ510 is verified against a 103m met mast with first class anemometry using DNV-GL process
- The site and met tower are fully IEC 61400-12-1 compliant and approved by DNV-GL
- Every AQ510 comes with a detailed verification report

"By measuring wind conditions across and above the turbine rotor, remote sensing technologies can play a key role in cutting the cost of wind energy." - DNV- GL

DNV·GL

AQSystem test site

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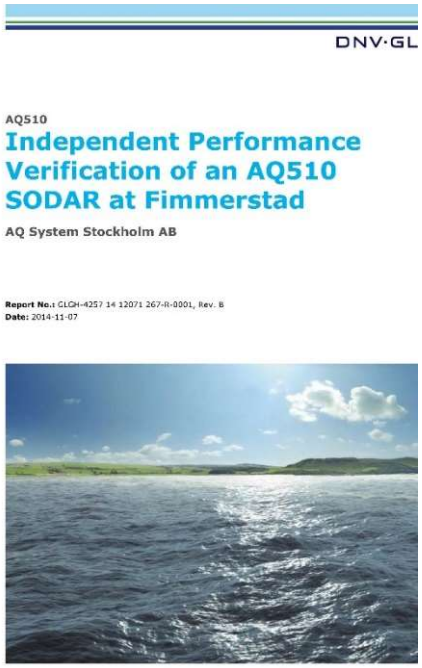
PROVEN ACCURACY

- Independent verification reports available

"Up to now the AQ510 is the best SoDAR we had in a verification outperforming even Some LiDAR units". – Thomas Latacz at BBB Umwelttechnik

BBB Renewable Energies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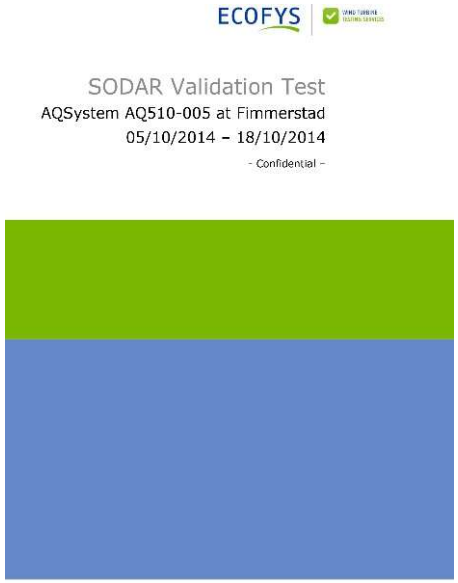
AQ510

Independent Performance Verification of an AQ510 SODAR at Fimmerstad

AQ System Stockholm AB

Report No.: GLGH-4257 14 12071 267-R-0001, Rev. B
Date: 2014-11-07

DNV·GL


ECOFYS

SODAR Validation Test
AQSystem AQ510-005 at Fimmerstad
05/10/2014 – 18/10/2014
- Confidential -

ECOFYS


BBB

VERIFICATION REPORT

Verification of the remote sensing device:
AQ510 003

at the verification site

Fimmerstad

Västergötland / Sweden

prepared by

Thomas Latacz

BBB UMWELTTECHNIK
ERNEUERBARE ENERGIEN GMBH

Weiden, 29.10.2014
Report no.: BBB-V1413-1

BBB Renewable Energies

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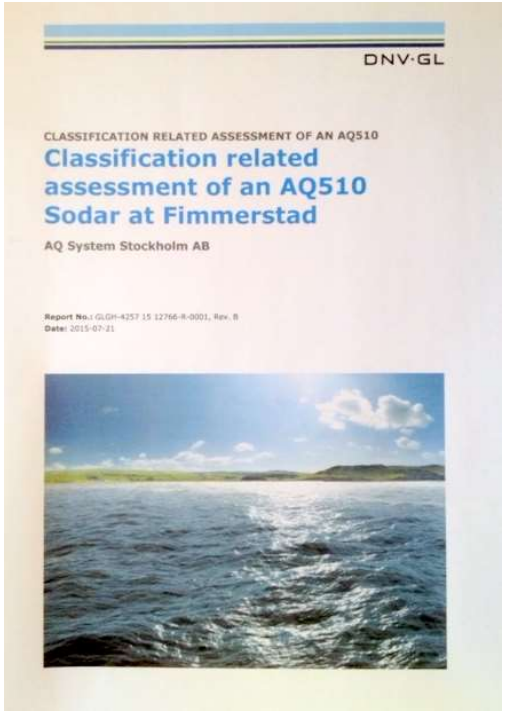
FULLY CLASSIFIED

- First remote sensor in the world fully classified according to IEC 61400-12-1:2017

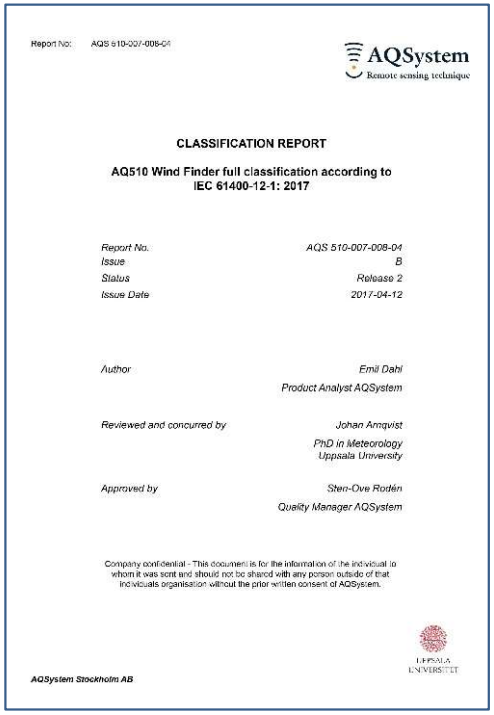

DNV·GL

CLASSIFICATION RELATED ASSESSMENT OF AN AQ510

Classification related assessment of an AQ510 Sodar at Fimmerstad

AQ System Stockholm AB

Report No.: GLGH-4257 15 12766-R-0001, Rev. B
Date: 2015-07-21


Report No: AQS 510-007-008-04

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CLASSIFICATION REPORT

AQ510 Wind Finder full classification according to IEC 61400-12-1: 2017

Report No.	*AQS 510-007-008-04*
Issue	*B*
Status	*Release 2*
Issue Date	*2017-04-12*
Author	*Emil Dahl*
	Product Analyst AQSystem
Reviewed and concurred by	*Johan Arnqvist*
	PhD in Meteorology Uppsala University
Approved by	*Sten-Ove Rodén*
	Quality Manager AQSystem

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UPPSALA UNIVERSITET

AQSystem Stockholm AB

DNV·GL

CLIENTS & PARTNERS

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acciona

GPSS GROUP

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think energy

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THANK YOU!