Tower Testing
In Production
A manufacturers’ optimisation of wind turbine towers is related to the material choice and quality of welds. Typical questions are: How do I identify and quantify material defects – both above and below surfaces? How do I assure that welds are in accordance to prevailing standards? It has become increasingly important for manufacturers of wind turbine towers to preserve the customers’ confidence – often built over many years. This requires tower productions that live up to intended standards during later operation. For this, manufacturers rely on professional tower testing.

**Proven technology**

With yearly thousands of tower welding and blade examinations, we have a proven knowledge and expertise in tower testing in production.

The scanner solutions are developed in close co-operation with the world’s leading wind turbine manufacturers. We are also co-owner of and take active part in the Danish Blade Test Centre, a testing facility specialised in prototype approval testing of blades. Other partners are Risø National Laboratory of Denmark and Det Norske Veritas (DNV).
We offer manufacturers of wind turbine towers a selection of solutions aimed at different testing and documentation needs and purposes. The solutions are specifically developed and designed for tower testing in production. Choice of solution depends on production capacity and requirements for testing speeds. The solutions are; AMS-41, AMS-41-Light, AGS-1 and AGS-2.

**AMS-41**

is a unique and robust scanner solution, recommended for fast and reliable automated testing of circumferential welds on towers. AMS-41 is stationary in operation, yet easily operated and moved around in the workshop by one person. Complete testing of one circumferential weld is carried out in about 10 – 15 minutes. This out beats any alternative manual or semi automated solution in efficiency.

**Fast examinations**

An ordinary examination of circumferential welds or a flange weld on a wind turbine tower can take hours depending on the tower size and the number of flaw indicators. With scanning speed up to 35 mm/s, the AMS-41 is capable of reducing this long inspection time from hours to minutes – regardless of the number of flaw indications – saving man hours and overall production time. The tower is simply scanned on the roll support with the AMS-41 and the trolley can quickly be moved to the next weld on the tower.

AMS-41 is fast to calibrate as the trolley that the scanner is mounted on has been prepared for installation of calibration blocks. The flexible calibration concept is easily fitted to the individual task. The coupling agent that is used with the AMS-41 is simply water. This eliminates the unpleasant coupling gel normally used at an ultrasound scanning.

**AMS-41-Light**

is an alternative to the original AMS-41. It is equipped with the same scanning features for circumferential welds as AMS-41. However, mainly due to its dismantled on-board calibration blocks, AMS-41-Light is smaller and weighs less, compared to AMS-41. The AMS-41-Light is thus extremely handy and easy to use and you can easily bring the probes to the nearby calibration blocks.

**System interface**

AMS-41 and AMS-41-Light are delivered with interface to any original P-scan system. P-scan is designed with special attention to fast set up time, small equipment size, and ease of use, and is thereby offering increased productivity in use. Furthermore, the system has great flexibility to adapt to different testing situations and covers all major ultrasound testing techniques.
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**FEATURES**

- Robust and high quality automated testing
- Fast examinations – up to 35 mm/s
- Scanner handling by only one operator
- Thorough documentation and storage of results
- Scan wall thickness from 8 mm
- Butt welds and flange welds can be examined
- Water as coupling agent
- Configurated for pulse echo and TOFD testing
AGS-2

AGS-2 is an automatic, versatile, robust and flexible magnetic wheel solution for testing of all types of welds, longitudinal welds, flange welds, door frames as well as welds in wind turbine foundations. It is also very suitable for circumferential welds, and a good solution for spot examinations. AGS-2 is designed with use of modular components that makes it possible to configure it according to the actual requirements.

System interface
AGS-2 is delivered with interface to any original P-scan system. P-scan is designed with special attention to fast set up time, small equipment size, and ease of use, and is thereby offering increased productivity in use. Furthermore, the system has great flexibility to adapt to different testing situations and covers all major ultrasound testing techniques.

Technical specifications

<table>
<thead>
<tr>
<th>Velocities</th>
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<tbody>
<tr>
<td>X-direction</td>
<td>0 - 70 mm/s</td>
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<tr>
<td>Y-direction</td>
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<td>Y-direction</td>
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Object dimensions

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<tr>
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<tbody>
<tr>
<td>Min. OD (Circumferential drive)</td>
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<td>Min. OD (Longitudinal drive)</td>
<td>150 mm</td>
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<td>Min. OD (Helical drive)</td>
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<td>Min. ID (Longitudinal drive)</td>
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<tr>
<td>Maximum dimensions</td>
<td>Plane surface</td>
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</table>

Physical specifications

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<tr>
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<td>Width x length x height</td>
<td>406 x 384 x 110 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>12.0 kg</td>
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</table>
AGS-2 is an automatic magnetic wheel solution for testing of all types of welds; longitudinal welds, flange welds, door frames as well as welds in wind turbine foundations. It is also very suitable for circumferential welds, and a good solution for spot examinations.

FEATURES

- Use of standard modular testing components
- High X and Y speed operation
- Geometrical flexibility
- Curved Y modules are available as option for longitudinal inspection of pipes
- Steerable by means of a remote control
- Automatic tracking by means of optional inclinometer
- Guiding by means of magnetic guide strip and optional analogue guide/proximity sensors
AGS-1 is an efficient and reliable magnetic wheel solution for automated registration of defects in longitudinal welds and door frames. AGS-1 is very handy and is easily moved around in the workshop. AGS-1 is designed with use of modular components that makes it possible to configure the solution according to the actual requirements. AGS-1 is also very suitable for re-inspection of repaired areas.

**System interface**
AGS-1 is delivered with interface to any original P-scan system. P-scan is designed with special attention to fast set up time, small equipment size, and ease of use, and is thereby offering increased productivity in use. Furthermore, the system has great flexibility to adapt to different testing situations and covers all major ultrasound testing techniques.

**Technical specifications**

<table>
<thead>
<tr>
<th>Velocities</th>
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<tbody>
<tr>
<td>X-direction</td>
<td>0 - 70 mm/s</td>
</tr>
<tr>
<td>Y-direction</td>
<td>0 - 200 mm/s</td>
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<table>
<thead>
<tr>
<th>Object dimensions</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Min. OD (Circumferential drive)</td>
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<td>Maximum dimensions</td>
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**Physical specifications**

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<tbody>
<tr>
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<tr>
<td>Weight</td>
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**Options**
- Y modules with different length
- Sleeves for non ferritic steel
- Suction pad track
- Wheels for hot surfaces
- Conversion kit to AGS-2.

**FEATURES**

- Built from standard modular scanner components
- High X and Y speed operation
- Flexible — can be used on many surface geometries
- Stability
- Can be modified/upgraded for inspection of special geometries.

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![Image of AGS-1 with technical specifications and features as described in the text.](image-url)
We are among the leading technological consulting and service companies in Denmark and internationally. We make a targeted effort to sell highly specialised engineering knowledge for practical and cost-effective solutions to a wide range of businesses and industries. The solutions enhance customer competitiveness and are based on the customer and industrial insight that we have acquired over more than 70 years.

We are more than 1,300 employees located at the headquarters in Brøndby and in local offices all over Denmark and in the subsidiaries in Sweden, Norway, China, the USA and Singapore.

**Wind turbine industry**

Our division Sensor & NDE Innovation provides a wide range of technological consultancy services and actual solutions with the purpose of optimising and rendering the wind turbine industry's productivity more efficient.

We are worldwide leaders when it comes to applying the most innovative and effective sensor technologies to the wind turbine industry.

Example of use of our sensor technologies:

- On-site testing of blades and towers
- In production testing of blades and towers.

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Further information

E-mail: sales@p-scan.com