

RAVE

Measurement Channels Description

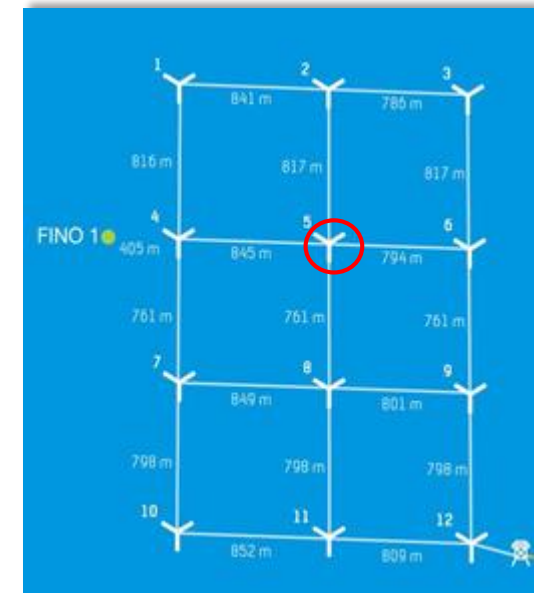
AV05 Wind Turbine

Period: from 2018-08-17 to ...



- Introduction
- Coordinate system and reference points at tower
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- Nacelle channels
- Rotor shaft channels
- Jacket channels

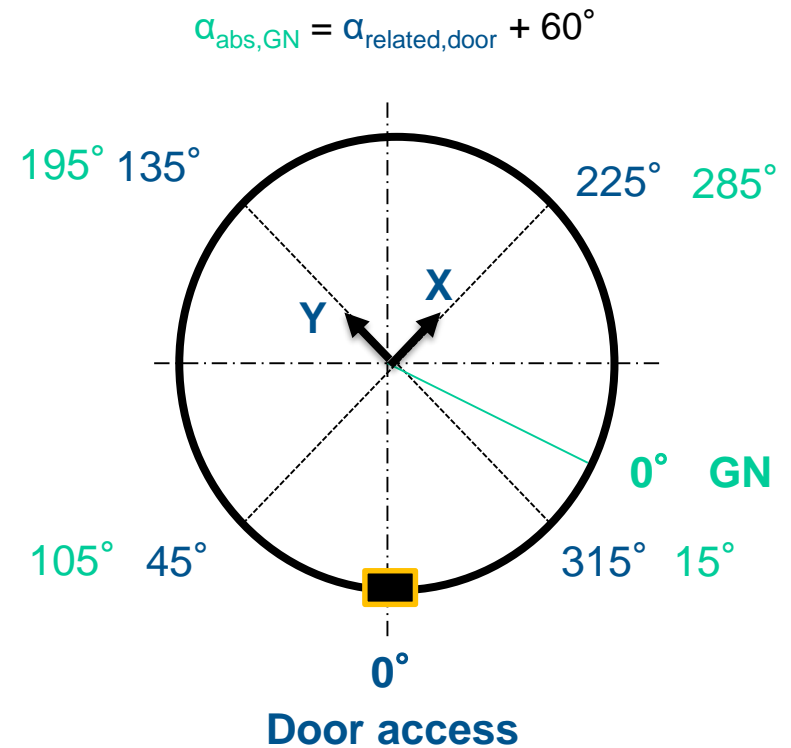
- In this presentation, you will find information about the measurement channel on the following parts of the AV05 Wind Turbine (WT):
 - Tower
 - Blades
 - Nacelle
 - Rotor shaft
 - Jacket
- Please refer to the attached excel file for further details about the sensors and its location.
- Mind the coordinate system presented in the next slide for the tower and in the attached sketches for the rest of the parts.
- The location of the AV05 WT in the Alpha Ventus Offshore wind farm is shown in the figure on the right.



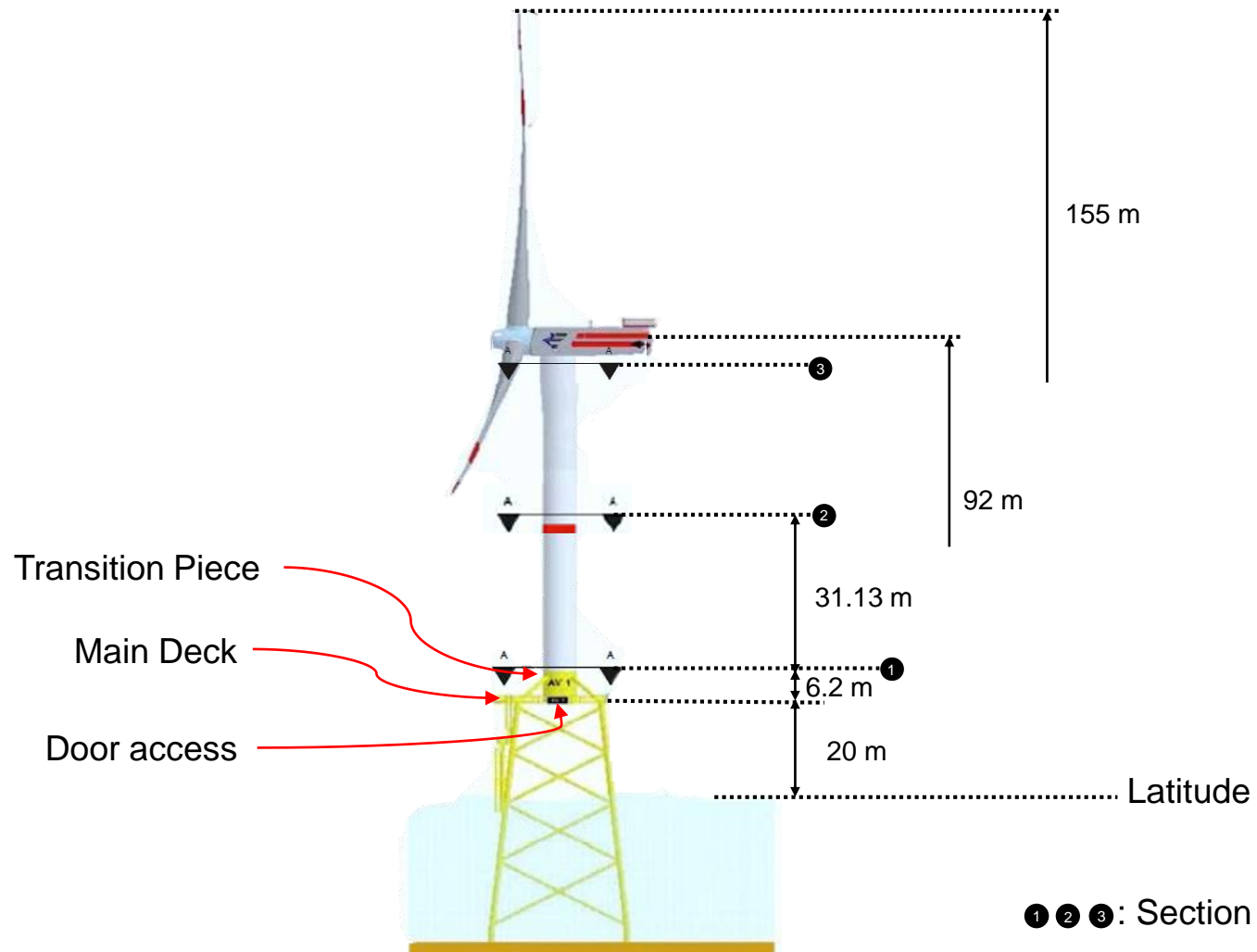
COORDINATE SYSTEM AND REFERENCES TOWER (1/2)

The coordinate system of the measurements taken on the tower is presented on the figure on the right:

- The sensors were located considering the door access as the 0° coordinate. This coordinate system origin can be found in the sketches of the sensors.
- The Geographical North (GN) is shifted 60° from the door access. The measurement names and descriptions are based on this coordinate system.



COORDINATE SYSTEM AND REFERENCES TOWER (2/2)



1 2 3: Section number at the tower

MEASUREMENT CHANNELS

- The measurement channels are going to be presented by three aspects:

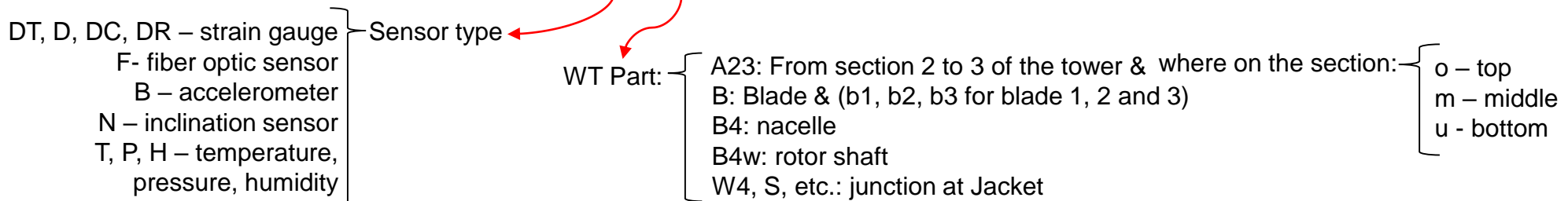
Channel Name | **Description** | **Sensor Type**

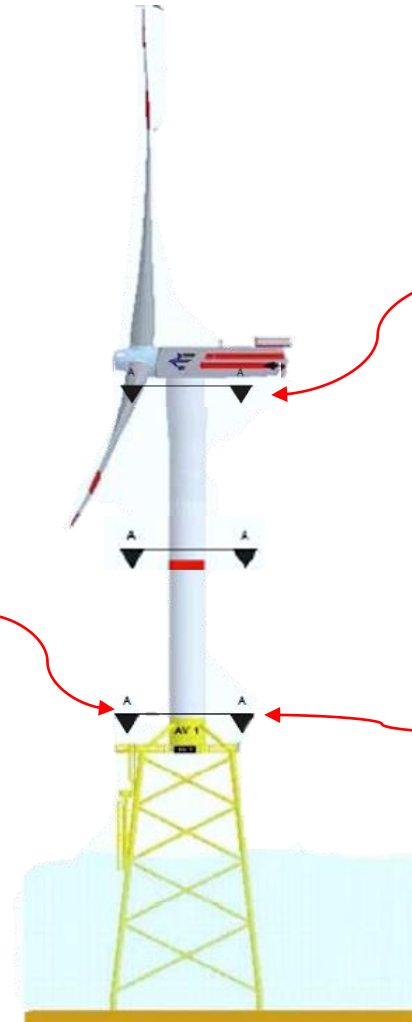
- The sensors are generally of the type:

Sensor Type	Description	Physical unit
DMS	Strain gauge	kNm
FOS	Fiber Optic Sensor	λ (wave length)
Environmental, PT-100	Temperature, humidity, pressure	°C, %, hPa
Inclinometer	Inclination angle	°
Control	Various	rpm, °, kW, m/s
ICP	Accelerometer	m/s ²

- A general rule to understand the measurement channels name with an example:

Turbine nr. 5 ← **R5 DT A23o 1_2** → This measurement results from two sensors located 180° apart



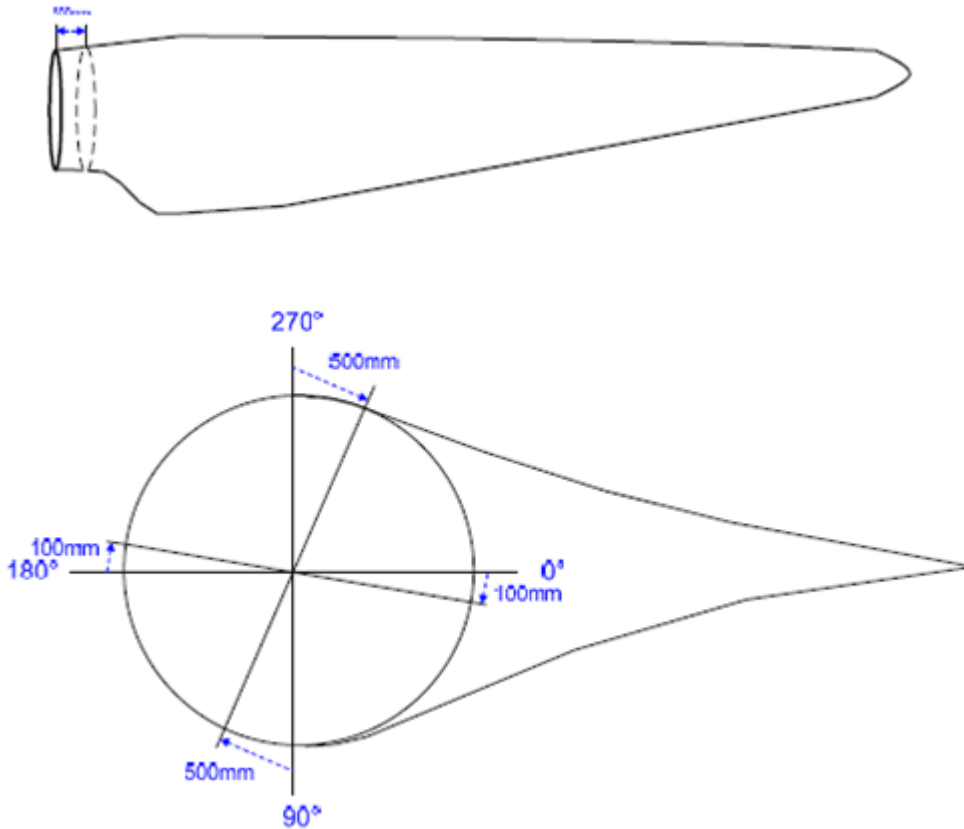


R5_B-A12u(x)	Acceleration x-direction 105°	ICP
R5_B-A12u(y)	Acceleration y-direction 105°	ICP

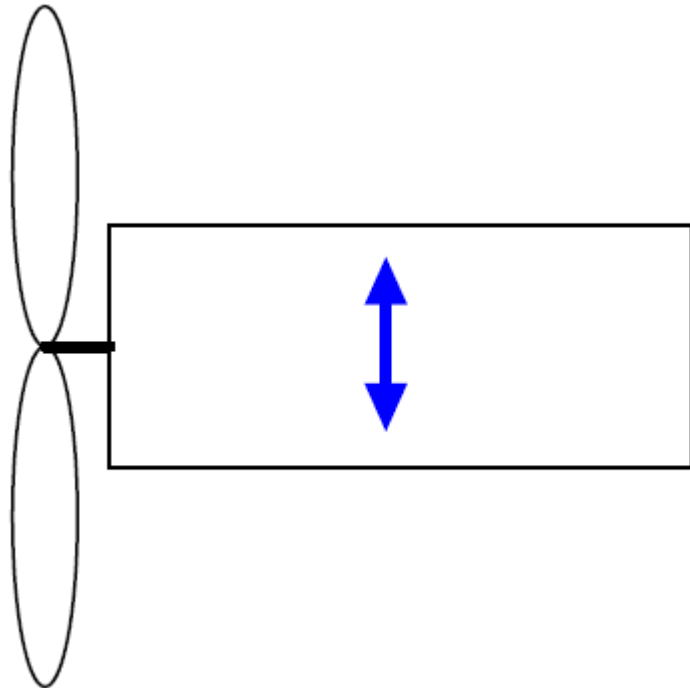
R5_DT_A23o_1_2	Tower Bending Moment (15° and 195°)	DMS
R5_DT_A23o_3_4	Tower Bending Moment (105° and 285°)	DMS
R5_DT-A23o2_1_2	Tower Bending Moment (0° and 180°)	DMS
R5_DT-A23o2_3_4	Tower Bending Moment (90° and 270°)	DMS
R5_DT-A23ot	Torsion (138° and 318°)	DMS

R5_DT_A12u_1_2	Tower Bending Moment (15° and 195°)	DMS
R5_DT_A12u_3_4	Tower Bending Moment (105° and 285°)	DMS

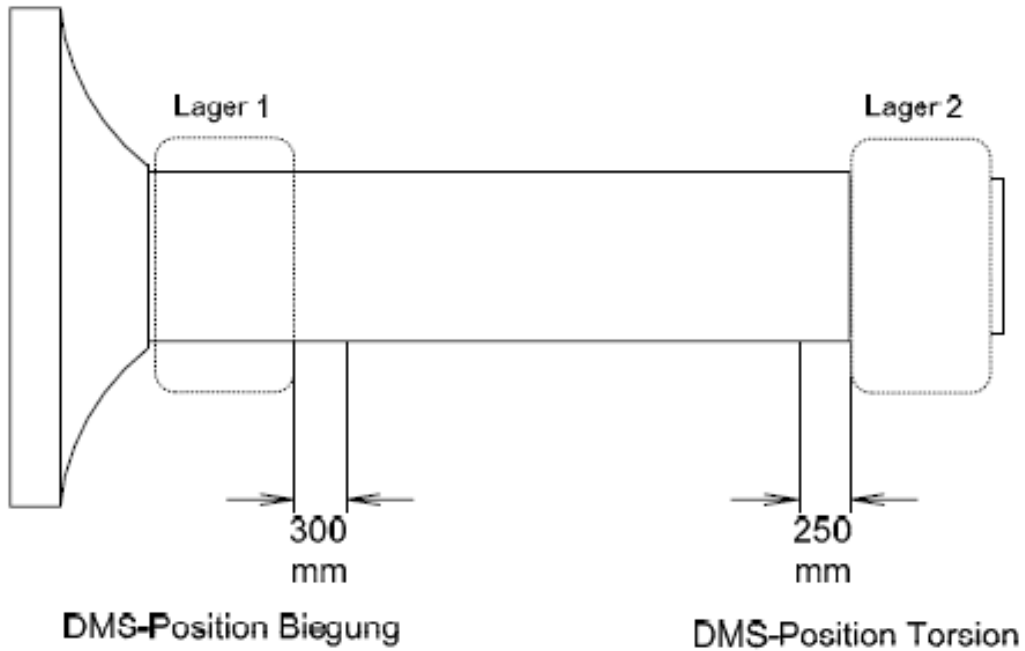
HUB-BLADE CONNECTION CHANNELS



R5_D-B5b1a1	Blade1-Edgewise bending moment 0°	DMS
R5_D-B5b1a2	Blade1-Flapwise bending moment 90°	DMS
R5_D-B5b2a1	Blade2-Edgewise bending moment 0°	FOS
R5_D-B5b2a2	Blade2-Flapwise bending moment 90°	FOS
R5_D-B5b3a1	Blade3-Edgewise bending moment 0°	FOS
R5_D-B5b3a2	Blade3-Flapwise bending moment 90°	FOS



R5_Azimutwinkel_B4_50Hz	Azimut angle	Control
R5_Generatordrehzahl_B4_50Hz	Generator revolutions	Control
R5_Pitchwinkel_Ist_B4_50Hz	Pitch angle	Control
R5_elektrische_Leistung_B4_50Hz	Electrical power	Control
R5_Windgeschwindigkeit_B4_50Hz	Wind speed	Control



R5_Rotorposition_B4	Angle	Inductive sensor
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