

ISO 20816-21:2025-05 (E)

Mechanical vibration - Measurement and evaluation of machine vibration - Part 21: Horizontal axis wind turbines

Contents

	Page
Foreword.....	v
Introduction.....	vi
1 Scope.....	1
2 Normative references.....	2
3 Terms and definitions.....	2
4 Measurement procedures.....	2
4.1 General.....	2
4.2 Measurement positions.....	3
4.3 Measurement equipment requirements.....	3
4.4 Vibration transducer mounting and connection.....	4
4.5 Measurement and assessment of vibration quantities.....	4
4.5.1 General.....	4
4.5.2 Bandpass frequency ranges.....	5
4.5.3 Broad-band assessment of vibration values.....	6
4.5.4 Evaluation period.....	6
4.6 Formation of assessment vibration quantities.....	7
4.7 Operating conditions prevailing when taking measurements.....	8
5 Measurements and interpretations.....	8
5.1 General.....	8
5.2 Nacelle and tower.....	9
5.2.1 General.....	9
5.2.2 Assessment vibration quantities.....	9
5.2.3 Typical measurement positions.....	9
5.2.4 Measurement directions for the nacelle.....	9
5.3 Main rotor (main shaft).....	10
5.3.1 Assessment vibration quantities.....	10
5.3.2 Typical measurement positions.....	10
5.3.3 Measurement directions.....	10
5.4 Main gearbox.....	10
5.4.1 Assessment vibration quantities.....	10
5.4.2 Measurement positions for wind turbines with separately mounted gearboxes with integrated rotor bearings.....	10
5.4.3 Measurement directions.....	11
5.5 Generators in wind turbines with a gearbox.....	11
5.5.1 Assessment vibration quantities.....	11
5.5.2 Typical measurement positions.....	11
5.5.3 Measurement directions.....	11
5.6 Generators in direct drive wind turbines.....	11
5.6.1 Assessment vibration quantities.....	11
5.6.2 Typical measurement positions.....	12
5.6.3 Measurement directions.....	12
6 Evaluation criteria.....	12
6.1 General.....	12
6.2 Evaluation method for different wind turbine designs.....	12
6.3 Evaluation zones.....	13
6.4 Changes in vibration magnitude.....	13
6.5 Condition monitoring and diagnostics.....	13
6.6 Evaluation zone boundaries.....	14

7	Setting operational limits	14
7.1	General.....	14
7.2	Definition of ALERT limits.....	15
7.3	Definition of the ALARM limits	15
7.4	TRIP limits.....	15
Annex A	(informative) Zone boundary evaluation	16
Annex B	(informative) Wind turbine working principles	18
Annex C	(informative) Diagrams of two typical wind turbine designs with gearbox	20
Annex D	(informative) Diagrams of typical direct drive wind turbine designs	22
Annex E	(informative) Measurement protocol example	26
Bibliography	28