

ISO 16079-2:2020 (E)

Condition monitoring and diagnostics of wind turbines — Part 2: Monitoring the drivetrain

Contents

	Foreword
	Introduction
1	Scope
2	Normative references
3	Terms and definitions
4	Abbreviated terms
5	Failure mode and symptoms analysis (FMSA)
5.1	General
5.2	The process of the FMSA analysis
6	Descriptors for fault detection
6.1	General
6.2	Descriptor types
6.3	Descriptors based on process parameters — Operational values
6.3.1	General
6.3.2	Measurement of process parameter descriptors
6.4	Measurement of rotational speed and descriptors based on rotational speed
6.4.1	General
6.4.2	Measurement of rotational speed
6.5	Descriptors based on vibration
6.5.1	References to other standards
6.5.2	General
6.5.3	Measurement of vibration
6.5.4	Transducers for vibration measurements
6.5.4.1	IEPE type accelerometers
6.5.4.2	MEMS based accelerometers
6.5.5	Vibration transducer mounting
6.6	Descriptors based on stress wave measurements
6.6.1	General
6.6.2	Measurement of stress waves
6.6.3	Transducers for stress wave measurement
6.6.4	Mounting of stress wave sensors
6.7	Descriptors based on oil debris in lubricant oil
6.7.1	General
6.7.2	Oil debris descriptors
6.7.3	Oil debris sensors
7	Descriptor monitoring interval
7.1	Reference to other standards
7.2	Factors influencing the monitoring interval
8	Descriptor notification criteria
8.1	Reference to other standards
8.2	General
8.3	Establishing descriptor alarm and alert limits for a new turbine
8.4	Establishing alarm and alert limits for a turbine in normal operating condition
8.5	Establishing alert limits upon component change

- 9 **Handling changes in operating conditions — The operational state bin concept**
 - 9.1 **General**
 - 9.2 **Example of how to use active power as an operational state**
- 10 **Transducer locations**
 - 10.1 **Reference to other standards and guidelines**
 - 10.2 **Location of vibration transducers**
 - 10.3 **Location of stress wave transducers**
 - 10.4 **Location of oil debris sensors**
 - 10.5 **Example of naming conventions and transducer locations**
- 11 **Baseline — Initial recording of data for diagnosis at commissioning time**
 - 11.1 **General**
 - 11.2 **Duration of time waveforms for baseline recording**
 - 11.3 **Repeatability and stability of time waveform recordings**
 - 11.4 **Sampling rate of time waveform for baseline recording**
 - 11.5 **Initial check of the baseline data — Recommendations**
- 12 **Diagnosis of faults and their causes**
 - 12.1 **Reference to other standards**
 - 12.2 **General**
 - 12.3 **Component data**
 - 12.4 **Raw-data time waveforms for detailed diagnosis**
 - 12.5 **Regular recording**
 - 12.6 **Recording on request**
- 13 **Prognosis**
 - 13.1 **Reference to other standards**
 - 13.2 **General**
 - 13.3 **Type I — Failure data-based prognostics — Statistically based**
 - 13.4 **Type II — Stress based prognostics — Model based**
 - 13.5 **Type III — Data-driven method — Condition based**
- 14 **Review of the condition monitoring and diagnosis system design**
 - 14.1 **Reference to other standards**
 - 14.2 **General**
 - 14.3 **Assessment of effectiveness of the condition monitoring system**
 - 14.4 **Cost benefit analysis**
 - 14.4.1 **General**
 - 14.4.2 **Simple model**
 - 14.4.3 **Advanced model**
- Annex A (informative) Details on vibration-based descriptor types**
 - A.1 **Time-domain-based descriptors**
 - A.2 **Frequency domain-based narrowband descriptors**
 - A.2.1 **General**
 - A.2.2 **Frequency domain-based-descriptors generated by feature extraction**
 - A.3 **Pre-processing of time waveforms prior to frequency analysis**
 - A.3.1 **General**
 - A.3.2 **Angular resampling of the time waveform**
 - A.3.3 **Time domain averaging**
 - A.4 **Feature extraction based on other analysis methods**
 - A.4.1 **General**
 - A.4.2 **Demodulation — Envelope technique**
 - A.4.3 **Cepstrum analysis**
 - A.5 **Descriptor measurement time**
- Annex B (informative) FMSA analysis of the drivetrain**