

ISO 14839-5:2022-08 (E)

Mechanical vibration - Vibration of rotating machinery equipped with active magnetic bearings - Part 5: Touch-down bearings

Contents		Page
Foreword		v
1 Scope	1	
2 Normative references	2	
3 Terms and definitions	2	
4 General structure and components	2	
5 Functional targets	4	
5.1 General	4	
5.2 Design life	6	
5.3 Clearance requirements	6	
5.4 Life-cycle requirements	6	
6 Touch-down bearing design considerations	7	
6.1 General	7	
6.2 Trigger events	7	
6.2.1 Overload due to abnormal process conditions	7	
6.2.2 AMB control instability	8	
6.2.3 Loss of power	9	
6.2.4 Failure in the AMB system	10	
6.2.5 Misoperation	10	
6.3 Transportation duty	10	
6.3.1 General	10	
6.3.2 AMBs without permanent magnets	11	
6.3.3 AMBs with permanent magnets	11	
6.4 Failure modes	12	
6.4.1 General	12	
6.4.2 Rolling element failure modes	12	
6.4.3 Sliding bearing failure modes	13	
6.5 Environmental factors	13	
6.5.1 General	13	
6.5.2 Corrosion resistance	13	
6.5.3 Erosion resistance, particulate contamination	14	
6.5.4 Liquid contamination	14	
6.5.5 Operating temperature	14	
6.5.6 Available cooling flow	14	
6.6 Rotordynamic modelling considerations	14	
6.6.1 General	14	
6.6.2 Rotor and housing modelling requirements	14	
6.6.3 Touch-down bearing soft mount design considerations	16	
6.6.4 Touch-down bearing clearance design considerations	16	
6.6.5 Friction between the rotor and touch-down bearing design considerations	16	
6.7 Contact classification/severity	17	
6.7.1 Contact duration	17	
6.7.2 Types of motion	17	
6.8 Control actions following touch-down bearing contact	19	
6.8.1 General	19	
6.8.2 AMB controller action	19	

6.8.3	Plant/variable-frequency drive control actions	19
7	Design and design verification	19
7.1	General	19
7.2	Design process details	20
7.3	Documentation	30
8	Condition monitoring and damage estimation methods	30
8.1	General	30
8.2	Event detection and data capture	30
8.2.1	Contact detection	30
8.2.2	Contact event	30
8.3	Inspection	31
8.3.1	General	31
8.3.2	Common techniques in non-intrusive inspection	31
8.3.3	Intrusive inspection	32
8.4	Damage estimation	34
8.4.1	Event data	34
8.4.2	Inspection-based estimation	35
8.4.3	Criteria for further operation	36
9	Maintenance and life cycle factors	37
9.1	General	37
9.2	Inspection plan	37
9.2.1	General	37
9.2.2	Minimum intervention cycle	37
9.3	Interventions	37
9.3.1	Routine checks	37
9.3.2	Predicted excessive damage accumulation	38
9.3.3	Contamination	39
9.4	Maintenance actions	39
9.4.1	General	39
9.4.2	Touch-down-bearing refurbishment	39
9.4.3	Touch-down bearing replacement	40
9.5	Life-cycle factors	41
9.5.1	General	41
9.5.2	Spare part management	41
9.5.3	Decommissioning, recycling and disposal	42
9.5.4	Obsolescence management	42
	Bibliography	43