

ISO 81400-4:2005-10 (E)

Wind turbines - Part 4: Design and specification of gearboxes

Contents		Page
Foreword iv		
1	Scope 1	
2	Normative references 1	
3	Definitions and symbols 2	
4	Design specification 7	
5	Gearbox design and manufacturing requirements 11	
6	Lubrication 28	
7	Other important items 33	
Bibliography 92		
 Annexes		
A Wind turbine architecture 35		
B	Wind turbine load description 41	
C	Quality assurance 49	
D	Operation and maintenance 55	
E	Minimum purchaser and gearbox manufacturer ordering data 57	
F	Lubrication selection and condition monitoring 61	
G	General gear information 77	
H	Determination of the application factor, KA, from a given load spectrum using the equivalent torque, Teq 79	
I	Bearing stress calculation 83	
 Figures		
1	3--stage parallel shaft gearbox 20	
2	3--stage planet/helical hybrid 20	
3	Bearing assembly 21	

Tables

1 Symbols 3

2 Minimum basic rating life, Lh10 13

3 Guide values for maximum contact stress for rolling element bearings at Miner's sum dynamic equivalent bearing load 13

4 Bearing lubricant operating temperature for calculation of viscosity ratio, 14. 5 Temperature gradients for calculation of operating clearance 15

6 Required gear accuracy 17

7 Recommended gear tooth surface roughness 17

8 Bearings for combined loads 18

9 Bearings for pure radial load 19

10 Bearings for pure axial loads 19

11 Bearing selection matrix -- legend to symbols 22

12 Bearing selection matrix for the low speed shaft/planet carrier 22

13 Bearing selection matrix for the low speed intermediate shaft 23

14 Bearing selection matrix for the high speed intermediate shaft 24

15 Bearing selection matrix for the high speed shaft 25

16 Bearing selection matrix for the planet wheel 26

17 Lubricant cleanliness 30