

Precision Gearbox: Market Strategies and Forecasts, Worldwide, 2018-2024

Table of Contents

Precision Gearbox: Executive Summary

The study is designed to give a comprehensive overview of the Precision Gearbox market segment. Research represents a selection from the mountains of data available of the most relevant and cogent market materials, with selections made by the most senior analysts. Commentary on every aspect of the market from independent analysts creates an independent perspective in the evaluation of the market. In this manner the study presents a comprehensive overview of what is going on in this market, assisting managers with designing market strategies likely to succeed.

Table of Contents

Precision Gearbox Reduction Gearbox Market Executive Summary	16
Precision Gearbox Reduction Gearboxes Market Driving Forces	16
Two Main Types of Speed Reducer Used In Robotics: RV Reducer and Harmonic Reducer	18
Precision Gearbox Reduction Gearboxes Market Shares	18
Precision Gearbox Reduction Gearboxes Market Forecasts	24
1. Harmonic Gearbox: Market Description and Market Dynamics	27
1.1 Precision Gearbox Precision Gearing	27
1.2 Precision Gearbox Concept of Total Motion Control	33
2. Precision Gearbox Reduction Gearbox Market Shares and Market Forecasts	34
2.1 Precision Gearbox Reduction Gearboxes Market Driving Forces	34
2.1.1 Two Main Types of Speed Reducer Used In Robotics: RV Reducer and Harmonic Reducer	36

2.2 Precision Gearbox Reduction Gearboxes Market Shares	36
2.2.1 List of Precision Gearbox Companies by Country	43
2.3 Precision Gearbox Reduction Gearboxes Market Forecasts	44
2.4 Precision Gearbox Reduction Gearboxes Market Application Analysis	47
2.4.1 VTOL Gearbox	50
2.4.2 Harmonic Drives in Industrial Robots	51
2.4.3 Precision Gearbox Reduction Gearbox Robotic Applications	58
2.4.4 Harmonic Gear Robotics	59
2.4.5 Precision Gearbox Reduction Gear SCARA Robots Applications	60
2.4.6 Precision Gearbox Applications	61
2.5 Cup-, Hat- Pancake Type Precision Gearbox Component Sets	63
2.5.1 Harmonic Drive® Pancake Gearing Components includes: Ultra Flat Gearing Components	66
2.5.2 Hat Style	69
2.6 Precision Gearbox Strain Wave Gears Prices	71
2.6.1 Shopping Results	71
2.7 RV Precision Reducer	74
2.8 Precision Gearbox Strain Wave Gears Regional Market Analysis	78
2.8.1 China	81
2.8.2 Chinese Pearl River Delta Region Implements Wave Of Automation	83
2.8.3 Robot Situation in China	85
2.8.4 Japanese Economy Continued To Recover	87
3. Precision Gearbox Reduction Gearbox Product Descriptions	88
3.1 Precision Gearbox Product Applications:	88
3.1.1 Precision Gearbox Reduction Gear Communication Protocols	89
3.1.2 Precision Gearbox Reduction Gearbox Product	90
3.1.3 The Components	91

3.1.4	Cup-Type Harmonic Drive	95
3.1.5	Superior Gear Performance Using an S Tooth Design	95
3.2	Motion Control	98
3.3	Leaderdrive	99
3.3.1	Leaderdrive Strain wave reducer principle	101
3.3.2	Leaderdrive Characteristics of Strain Wave Reducer	102
3.4	Zhejiang Laifu Reduction Gearbox	105
3.4.1	Zhejiang Laifu Advantages of Reduction Gearbox	106
3.4.2	Zhejiang Laifu Harmonic Gear Reducer Applications	109
4.	Harmonic Reduction Gearbox Technology	112
4.1	RV Reducer	112
4.2	Harmonic Drive® Strain Wave Gearing	114
4.2.1	Harmonic Speed Reducer Is Core Part Of The Robot That Achieves	
Movement	118	
4.3	Harmonic Reduction Gear Meshing Theory	122
5.	Precision Gearbox Reduction Gear Company Profiles	124
5.1	Beijing CTKM Harmonic Drive	124
5.2	Beijing Precision Gearbox Technology Institute (BHDI)	127
5.2.1	Beijing Precision Gearbox Technology Institute	127
5.3	Beijing Zhong Ke Ke Mei Precision Gearbox Limited Liability Company	128
5.4	China Precision Gearbox (CHD®)	129
5.5	Cone Drive	130
5.6	Precision Gearbox LLC	133
5.6.1	Precision Gearbox High-Precision, Zero-Backlash Strain Wave Gears	
Application Areas		141
5.6.2	Harmonic Drive® Gear Units	141
5.6.3	Precision Gearbox Miniature Gear Units	147
5.6.4	Precision Gearbox CSF-2XH	147

5.6.5	Precision Gearbox CSF-1U-CC	147
5.6.6	Precision Gearbox CSF-1U-CC-F	148
5.6.7	Precision Gearbox CSF-1U	148
5.6.8	Precision Gearbox CSF-2UP	149
5.6.9	Precision Gearbox Servo Mount Gearheads	150
5.6.10	Precision Gearbox Customers	150
5.6.11	Precision Gearbox Sales by Product Segment	155
5.6.12	Precision Gearbox Precision Speed Reducers	157
5.6.13	Precision Gearbox Sales by Application Segment	158
5.7	Leader Precision Drive	177
5.7.1	Leader Precision Drive Revenue	181
5.7.2	Leader Harmonious Drive Systems Harmonic Reduction Gear Meshing	
Theory	182	
5.7.3	Leader Precision Drive Revenue	183
5.8	Motion Control Products	183
5.9	Nabtesco	189
5.9.1	Nabtesco	189
5.9.2	Nabtesco Wind Turbine RV and RD Reducers for Generators	198
5.9.3	Nabtesco Wind Turbine RV and RD Reducers for Rotary Tables	199
5.9.4	Nabtesco's Cycloidal Gear Technology	201
5.9.5	Nabtesco Revenue	202
5.10	Nidec-Shimpo	208
5.10.1	Nidec-Shimpo Amereica	213
5.11	Parker Bayside	213
5.12	Sumitomo Heavy Industries	214
5.12.1	Sumitomo Heavy Industries Revenue	217
5.13	Suzhou Green Precision Gearbox Technology Co., Ltd.	219

5.14 Total Industry Group / Ningbo Haishu Total Imp. & Exp. Co., Ltd.	220
5.15 Zhejiang Laifu Precision Strain Wave Reducer Gearbox	221
5.16 List of Selected United States Precision Gearbox Reduction Gear Companies	223
WinterGreen Research,	226
WinterGreen Research Methodology	227

List of Figures

Figure 1. Precision Gearbox Reduction Gearboxes Market Driving Forces	17
Figure 2. Harmonic Reduction Gearbox Market Shares, Dollars, Worldwide, First Three Quarters 2017	19
Figure 3. Harmonic Reduction Gearbox Market Shares, Dollars, Worldwide, First Three Quarters 2017	20
Figure 4. Precision Gearbox Large US Customers	22
Figure 5. Precision Gearbox Precision Strain Wave Reducer Gearboxes Market Shares, Dollars, US, 2017	23
Figure 6. Precision Gearbox Precision Strain Wave Reducer Gearboxes, Forecasts, Dollars, Worldwide, 2018-2024	26
Figure 7. Precision Gearbox Precision Gearing Features	28
Figure 8. Precision Gearbox Reduction Gear Description	29
Figure 9. Precision Gearbox Precision Gearing Functions	30
Figure 10. Precision Gearbox Gearbox Market Classification By Type	31
Figure 11. Precision Gearbox Gearbox Market Classification By Application	31
Figure 12. Harmonic Gearbox Robot Manufacturer Application Benefits	32
Figure 13. Precision Gearbox Concept of Total Motion Control	33

Figure 14. Precision Gearbox Reduction Gearboxes Market Driving Forces	35
Figure 15. Harmonic Reduction Gearbox Market Shares, Dollars, Worldwide, First Three Quarters 2017	37
Figure 16. Harmonic Reduction Gearbox Market Shares, Dollars, Worldwide, First Three Quarters 2017	38
Figure 17. Precision Gearbox Large US Customers	40
Figure 18. Precision Gearbox Precision Strain Wave Reducer Gearboxes Market Shares, Dollars, US, 2017	41
Figure 19. Precision Gearbox Precision Strain Wave Reducer Gearbox, Market Shares, Dollars, US, 2017	42
Figure 20. United States Precision Gearbox Reduction Gears	44
Figure 21. Precision Gearbox Precision Strain Wave Reducer Gearboxes, Forecasts, Dollars, Worldwide, 2018-2024	46
Figure 22. Precision Gearbox Precision Strain Wave Reducer Gearbox Market Forecasts, Dollars, Worldwide, 2018-2024	47
Figure 23. Precision Gearbox Precision Strain Wave Reducer Gearbox Market Forecasts, Dollars, Worldwide, 2018-2024	48
Figure 24. Precision Gearbox Reduction Gearboxes Wind Turbine Functions	52
Figure 25. Precision Gearbox Reduction Gearbox Market Applications	53
Figure 26. Precision Gearbox Strain Wave Gears Antenna System Features	54
Figure 27. Precision Gearbox Strain Wave Gears Robotics Features	54
Figure 28. Precision Gearbox Strain Wave Gears Types	55
Figure 29. Precision Gearbox Gearbox Applications	56
Figure 30. Global Industrial Robot Unit Sales	59
Figure 31. Precision Gearbox Applications	61
Figure 32. Precision Gearbox Precision Strain Wave Reducer Gearbox Market Forecasts, Dollars, Worldwide, 2018-2024	63
Figure 33. Harmonic Drive® CSF Series Gearing Features	65
Figure 34. Harmonic Drive® CSD Series Gearing Features	66
Figure 35. Harmonic Drive® Series Flexspline of the Pancake Type Gearing Features	67

Figure 36. Harmonic Drive® FD Series Differential Gear Features	68
Figure 37. Harmonic Gearing Hat Style Features	69
Figure 38. Hat Style Harmonic Gearing SHF-2A-GR Series Features	70
Figure 39. RV and RD Reducers Market Shares, Dollars, Worldwide, First Three Quarters 2017	74
Figure 40. Robotic RV Reducers	75
Figure 41. Robotic RV Reducer Applications	76
Figure 42. Precision Gearbox Strain Wave Gears Consolidated Sales by Regional Segment	79
Figure 43. Precision Gearbox Precision Strain Wave Reducer Gearbox Regional Market Segments, 2017	80
Figure 44. Precision Gearbox Precision Strain Wave Reducer Gearbox Regional Market Segments, 2017	81
Figure 45. Precision Gearbox Product Applications:	88
Figure 46. Precision Gearbox Reduction Gear Drives Communication Protocols	89
Figure 47. Precision Gearbox Gearbox System Features:	90
Figure 48. Wave Generator	91
Figure 49. Flexspline	92
Figure 50. Precision Gearbox® Strain Wave Gear Flexspline	93
Figure 51. Circular Spline	94
Figure 52. Gear Performance Using an S Tooth Design	96
Figure 53. Precision Gearbox Applications	97
Figure 54. Motion Control Gearboxes	98
Figure 55. Leaderdrive Drive Reduction Gearboxes Products	99
Figure 56. Leaderdrive Drive Reduction Gearboxes	100
Figure 57. Leaderdrive Harmonic Meshing Tooth Shape, “P Type Tooth”	103
Figure 58. Leaderdrive P Type Tooth Benefits	104
Figure 59. Zhejiang Laifu Reduction Gearbox	105
Figure 60. Zhejiang Laifu Advantages of Reduction Gearbox	106

Figure 61. Reduction Gearbox Zhejiang Laifu Advantages of Transmission Speed Ratio	107
Figure 62. Baidu Strain Relief Reducer	110
Figure 63. Baidu Strain Relief Reducer Components	111
Figure 64. RV Reducer	113
Figure 65. Strain Wave Gear	115
Figure 66. Precision Gearbox Reduction Gearboxes United States Wave Generator	116
Figure 67. Precision Gearbox Reduction Gearboxes United States Flexspline	117
Figure 68. Precision Gearbox Reduction Gearboxes United States Circular Spline	118
Figure 69. Composition of Harmonic Drive: Three Basic Components	120
Figure 70. How Precision Gearbox Reduction Gearboxes Work	121
Figure 71. Beijing CTKM Precision Gearbox Target Markets	125
Figure 72. Cone Drive Harmonic Strain Wave Gear Satellite Communication	130
Figure 73. Cone Drive Harmonic Strain Wave Gear Industries	131
Figure 74. Cone Drive Harmonic Strain Wave Gear Industries Targeted	132
Figure 75. Precision Gearbox Revenue	133
Figure 76. Precision Gearbox Gearbox Applications	134
Figure 77. Precision Gearbox Sector Analysis	140
Figure 78. Precision Gearbox High-Precision, Zero-Backlash Strain Wave Gears Application Areas	141
Figure 79. Harmonic Drive® Features:	142
Figure 80. Precision Gearbox Key Features CSF-2UH:	143
Figure 81. Precision Gearbox CSF-2UH	144
Figure 82. Precision Gearbox Tighter Integration Into The Customer's Housing Or Machine Structure.	145
Figure 83. Precision Gearbox High-Precision, Zero-Backlash Strain Wave Gears	146
Figure 84. Precision Gearbox Large US Customers	151
Figure 85. Precision Gearbox inside Kuka 3,4,5 Axis Industrial Robot	151

Figure 86. Precision Gearbox Industry Colleagues	152
Figure 87. Precision Gearbox Strain Wave Gears	153
Figure 88. Precision Gearbox Strain Wave Gears Consolidated Sales by Regional Segment	154
Figure 89. Precision Gearbox Sales by Product Segment	155
Figure 90. Precision Gearbox Division Sales	156
Figure 91. Precision Speed Reducers	157
Figure 92. Precision Gearbox Sales by Application Segment	158
Figure 93. Precision Gearbox Sales by Application Segment, 2018 Q3	159
Figure 94. Precision Gearbox Factors in Change in Operating Income Q3 2017	160
Figure 95. Precision Gearbox Net Sales FY 2018/3	160
Figure 96. Precision Gearbox Sales Forecast by Division	161
Figure 97. Precision Gearbox Net Sales FY 2018/3 and Forecast by Division	162
Figure 98. Precision Gearbox Net Sales FY 2014/3 to 2017/3 with 2018/3 Forecast	163
Figure 99. Precision Gearbox Revenue Segment Analysis: Harmonic Drives, Mechatronics, and Planetary Drives	164
Figure 100. Precision Gearbox Global Bases	165
Figure 101. Precision Gearbox Global Bases Forecast of Industrial Robot Sales	166
Figure 102. Precision Gearbox Business Platforms	167
Figure 103. Harmonic Drive. ABB, Kuka Industrial Robot Customers in Germany, Boost from Industry 4,0	168
Figure 104. Precision Gearbox Current Production Structure	169
Figure 105. Precision Gearbox Future Production Structure	170
Figure 106. Precision Gearbox Plants	171
Figure 107. Precision Gearbox Concept of Total Motion Control	172
Figure 108. Precision Gearbox Growth Trajectory	173
Figure 109. Precision Gearbox Positioning	174
Figure 110. Harmonic Drive	175

Figure 111. Precision Gearbox Applications	176
Figure 112. Leader Harmonious Drive Co. Ltd Strain Wave Reducer Functions	178
Figure 113. Leader Harmonious Drive Co. Ltd Strain Wave Reducer Applications	179
Figure 114. Leader Precision Drive Buildings	179
Figure 115. Motion Control Gearbox	184
Figure 116. Motion Control SW1RU Harmonic Gearbox Features	184
Figure 117. Motion Control SW1RU Harmonic Gearbox Applications	185
Figure 118. Motion Control Products Specifications	186
Figure 119. Motion Control Customers	188
Figure 120. Nabtesco Gear Reducer Unit Sales	190
Figure 121. Nabtesco RV and RD Reducers Features	191
Figure 122. Nabtesco RV and RD Reducer	192
Figure 123. Nabtesco RV and RD Reducers Features	193
Figure 124. Nabtesco RV and RD Reducers Backlash	194
Figure 125. Nabtesco RV and RD Reducers Angular Transmission Accuracy	195
Figure 126. Nabtesco RV and RD Reducers	197
Figure 127. Nabtesco Wind Turbine RV and RD YAW Drive Mechanism Reducers for Generators	198
Figure 128. The Nabtesco RV and RD Reducers for Rotary Tables Features	200
Figure 129. Nabtesco's Cycloidal Gear Technology	201
Figure 130. Nabtesco Cycloidal Gear Technology Features	201
Figure 131. Nabtesco's Cycloidal Gearing Technology	202
Figure 132. Nabtesco Revenue by Segment	204
Figure 133. Nabtesco Revenue 2013 to 2016	206
Figure 134. Nidec-Shimpo Harmonic Precision Strain Wave Reducer Gearbox	208
Figure 135. Nidec-Shimpo Harmonic Precision Gearboxes	209
Figure 136. Nidec-Shimpo Harmonic Precision Strain Wave Reducer Gearbox Revenue by Segment	212

Figure 137. Parker Bayside Drive Reduction Gearbox	213
Figure 138. Sumitomo Heavy Industries Precision Gearbox	215
Figure 139. Sumitomo Heavy Industries Pyramid	218
Figure 140. Totel Industry Group / Ningbo Haishu Totel Imp. & Exp. Co., Ltd. Precision Gearbox Gearing	221
Figure 141. Zhejiang Laifu Harmonic Reducer Features	222