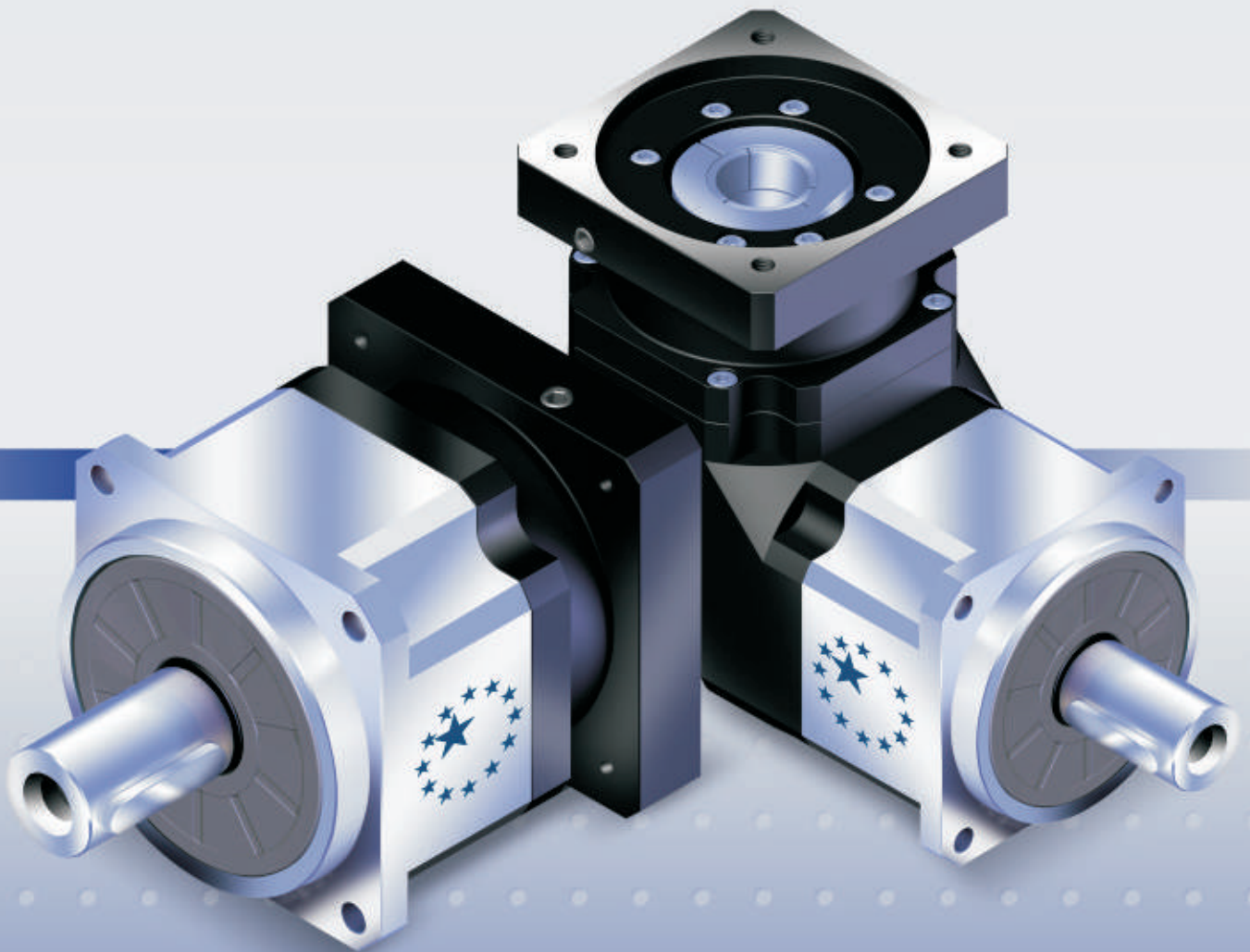




**APEX DYNAMICS, INC.**

# **AB / ABR Series**

**HIGH PRECISION PLANETARY GEARBOXES**



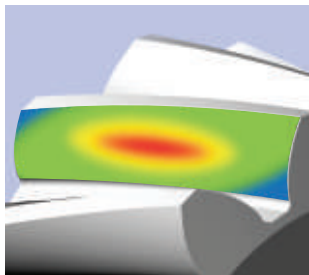
**Stainless**

# AB / ABR Series

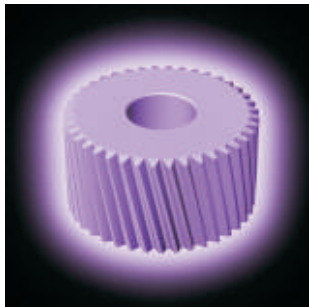
## Characteristic Highlights



Equipped with **solid uncaged needle roller bearings**, provides maximum contact points to increase stiffness and generates high output torque.



A high setting gear performance is achieved by using our **HeliTopo technology**. This **eases off the tooth profile** and **crowns the lead of each tooth**. This optimizes the gear mesh alignment and overlap to achieve maximum tooth surface contact.



Our **in house plasma nitriding** heat treatment process maintains the tooth surface hardness at **900Hv** for superior wear-resistance and a core hardness at **30 HRC** for toughness.



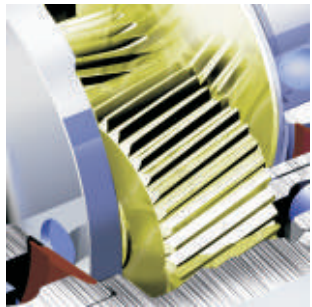
**One piece planet carrier with extended bearing design** provides maximum radial load capacity and increases system reliability and stiffness.



**True Helical Gear Design**  
Precision helical gearing increases tooth to tooth contact ratio by over 33% vs spur gearing. The helix angle produces smooth and quiet operation with decreased backlash (less than 1 arc-minutes and  $\leq 56\text{dB}$ ).

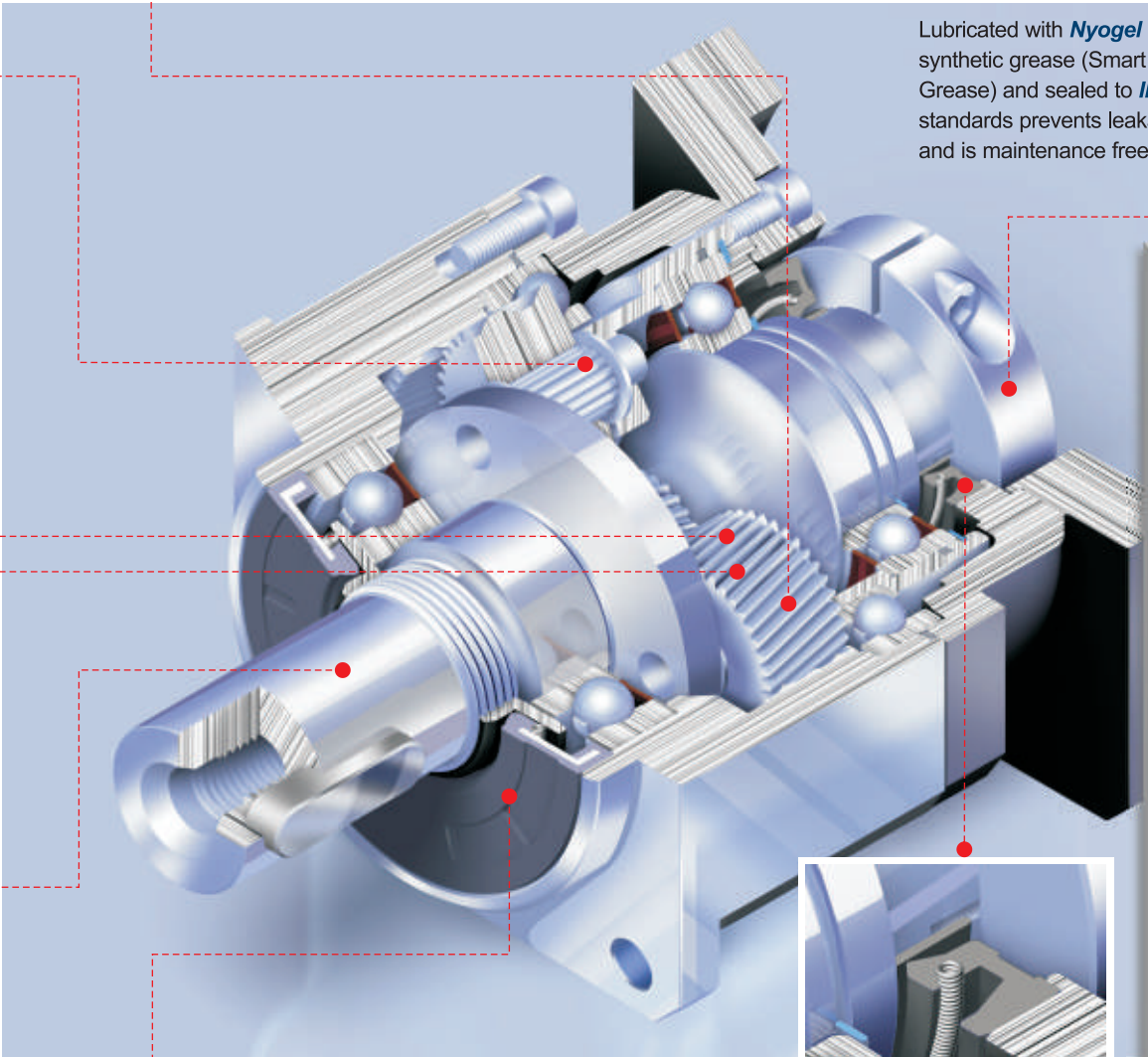


**Patented planet carrier design** puts the sun gear bearing directly into the planet carrier. It minimizes gear misalignment to gain higher accuracy.



**Triple split collet with dynamic balanced set collar clamping system** provides backlash free power transmission and eliminates slippage. 100% concentricity allows for smooth rotation and higher input speed capability.

Lubricated with **Nyogel 792D** synthetic grease (Smart Grease) and sealed to **IP65** standards prevents leakage and is maintenance free.

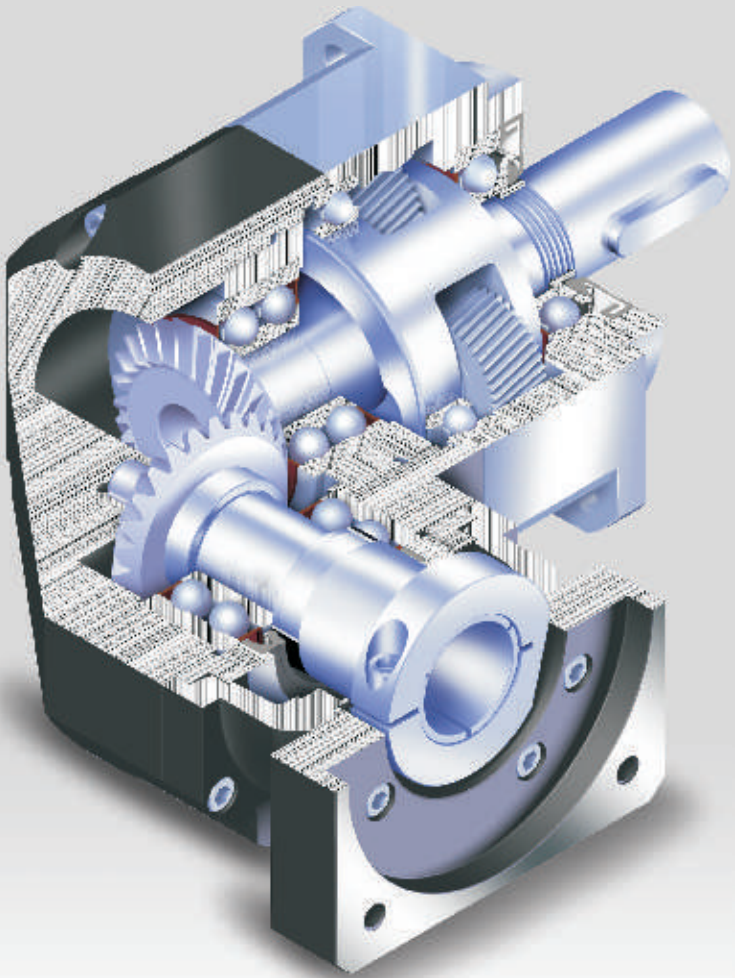


**NEW - Patented output sealing systems design** eliminates friction and heat generation which is accomplished by applying our hi-tech coating to all output contact surfaces. This coating reaches a hardness of **3700Hv** and is ground to  $R_a 0.2 \mu\text{m}$  finish to ensure sealing.



**NEW - Patented input sealing system design** eliminates break away torque and decreases friction/heat. The hi-tech coating bushing (**3700 Hv**,  $R_a 0.2 \mu\text{m}$  finish) interfaces with our proprietary seal which decreases wear and erosion of both sealing surfaces. This new patent prevents leakage and has a service life of over 20,000 hours.

## ABR Series



**ABR version** with 90° input via helical bevel gear. Featuring an extremely short, light yet rigid housing and full compatibility with standard motor adapters.

# AB Series

## Specifications

### Gearbox Performance

| Model No.                                            |           | Stage | Ratio  | AB042                               | AB060  | AB060A | AB090 | AB090A | AB115 | AB142 | AB180  | AB220  |
|------------------------------------------------------|-----------|-------|--------|-------------------------------------|--------|--------|-------|--------|-------|-------|--------|--------|
| Nominal Output Torque T <sub>2N</sub>                | Nm        | 1     | 3      | 20                                  | 55     | —      | 130   | —      | 208   | 342   | 588    | 1,140  |
|                                                      |           |       | 4      | 19                                  | 50     | —      | 140   | —      | 290   | 542   | 1,050  | 1,700  |
|                                                      |           |       | 5      | 22                                  | 60     | —      | 160   | —      | 330   | 650   | 1,200  | 2,000  |
|                                                      |           |       | 6      | 20                                  | 55     | —      | 150   | —      | 310   | 600   | 1,100  | 1,900  |
|                                                      |           |       | 7      | 19                                  | 50     | —      | 140   | —      | 300   | 550   | 1,100  | 1,800  |
|                                                      |           |       | 8      | 17                                  | 45     | —      | 120   | —      | 260   | 500   | 1,000  | 1,600  |
|                                                      |           |       | 9      | 14                                  | 40     | —      | 100   | —      | 230   | 450   | 900    | 1,500  |
|                                                      |           |       | 10     | 14                                  | 40     | —      | 100   | —      | 230   | 450   | 900    | 1,500  |
|                                                      |           | 2     | 15     | 20                                  | 55     | 55     | 130   | 130    | 208   | 342   | 588    | 1,140  |
|                                                      |           |       | 20     | 19                                  | 50     | 50     | 140   | 140    | 290   | 542   | 1,050  | 1,700  |
|                                                      |           |       | 25     | 22                                  | 60     | 60     | 160   | 160    | 330   | 650   | 1,200  | 2,000  |
|                                                      |           |       | 30     | 20                                  | 55     | 55     | 150   | 150    | 310   | 600   | 1,100  | 1,900  |
|                                                      |           |       | 35     | 19                                  | 50     | 50     | 140   | 140    | 300   | 550   | 1,100  | 1,800  |
|                                                      |           |       | 40     | 17                                  | 45     | 45     | 120   | 120    | 260   | 500   | 1,000  | 1,600  |
|                                                      | 2         | 45    | 14     | 40                                  | 40     | 100    | 100   | 230    | 450   | 900   | 1,500  |        |
|                                                      |           | 50    | 22     | 60                                  | 60     | 160    | 160   | 330    | 650   | 1,200 | 2,000  |        |
|                                                      |           | 60    | 20     | 55                                  | 55     | 150    | 150   | 310    | 600   | 1,100 | 1,900  |        |
|                                                      |           | 70    | 19     | 50                                  | 50     | 140    | 140   | 300    | 550   | 1,100 | 1,800  |        |
|                                                      |           | 80    | 17     | 45                                  | 45     | 120    | 120   | 260    | 500   | 1,000 | 1,600  |        |
|                                                      |           | 90    | 14     | 40                                  | 40     | 100    | 100   | 230    | 450   | 900   | 1,500  |        |
|                                                      |           | 100   | 14     | 40                                  | 40     | 100    | 100   | 230    | 450   | 900   | 1,500  |        |
| Emergency Stop Torque T <sub>2NOT</sub> <sup>2</sup> |           |       |        |                                     |        |        |       |        |       |       |        |        |
| Nm                                                   |           | 1,2   | 3~100  | 3 times of Nominal Output Torque    |        |        |       |        |       |       |        |        |
| Nominal Input Speed n <sub>1N</sub>                  |           | rpm   | 1,2    | 3~100                               | 5,000  | 5,000  | 5,000 | 4,000  | 4,000 | 4,000 | 3,000  | 3,000  |
| Max. Input Speed n <sub>1B</sub>                     | rpm       | 1,2   | 3~100  | 10,000                              | 10,000 | 10,000 | 8,000 | 8,000  | 8,000 | 6,000 | 6,000  | 4,000  |
| Micro Backlash P0                                    | arcmin    | 1     | 3~10   | —                                   | —      | —      | ≤1    | ≤1     | ≤1    | ≤1    | ≤1     | ≤1     |
|                                                      |           | 2     | 15~100 | —                                   | —      | —      | —     | —      | ≤3    | ≤3    | ≤3     | ≤3     |
| Reduced Backlash P1                                  | arcmin    | 1     | 3~10   | ≤3                                  | ≤3     | ≤3     | ≤3    | ≤3     | ≤3    | ≤3    | ≤3     | ≤3     |
|                                                      |           | 2     | 15~100 | ≤5                                  | ≤5     | ≤5     | ≤5    | ≤5     | ≤5    | ≤5    | ≤5     | ≤5     |
| Standard Backlash P2                                 | arcmin    | 1     | 3~10   | ≤5                                  | ≤5     | ≤5     | ≤5    | ≤5     | ≤5    | ≤5    | ≤5     | ≤5     |
|                                                      |           | 2     | 15~100 | ≤7                                  | ≤7     | ≤7     | ≤7    | ≤7     | ≤7    | ≤7    | ≤7     | ≤7     |
| Torsional Rigidity                                   | Nm/arcmin | 1,2   | 3~100  | 3                                   | 7      | 7      | 14    | 14     | 25    | 50    | 145    | 225    |
| Max. Radial Load F <sub>2rB</sub> <sup>3</sup>       | N         | 1,2   | 3~100  | 780                                 | 1,530  | 1,530  | 3,250 | 3,250  | 6,700 | 9,400 | 14,500 | 50,000 |
| Max. Axial Load F <sub>2a1B</sub> <sup>3</sup>       | N         | 1,2   | 3~100  | 350                                 | 630    | 630    | 1,300 | 1,300  | 3,000 | 4,000 | 6,200  | 35,000 |
| Max. Axial Load F <sub>2a2B</sub> <sup>3</sup>       | N         | 1,2   | 3~100  | 390                                 | 765    | 765    | 1,625 | 1,625  | 3,350 | 4,700 | 7,250  | 25,000 |
| Service Life                                         | hr        | 1,2   | 3~100  | 20,000*                             |        |        |       |        |       |       |        |        |
| Efficiency η                                         | %         | 1     | 3~10   | ≥97%                                |        |        |       |        |       |       |        |        |
|                                                      |           | 2     | 15~100 | ≥94%                                |        |        |       |        |       |       |        |        |
| Weight                                               | kg        | 1     | 3~10   | 0.5                                 | 1.3    | —      | 3.7   | —      | 7.8   | 14.5  | 29     | 48     |
|                                                      |           | 2     | 15~100 | 0.8                                 | 1.5    | 1.9    | 4.1   | 5.3    | 9     | 17.5  | 33     | 60     |
| Operating Temp                                       | °C        | 1,2   | 3~100  | -10°C~+90°C                         |        |        |       |        |       |       |        |        |
| Lubrication                                          |           | 1,2   | 3~100  | synthetic gear grease (NYOGEL 792D) |        |        |       |        |       |       |        |        |
| Degree of Gearbox Protection                         |           | 1,2   | 3~100  | IP65                                |        |        |       |        |       |       |        |        |
| Mounting Position                                    |           | 1,2   | 3~100  | all directions                      |        |        |       |        |       |       |        |        |
| Noise Level (n <sub>1</sub> =3000rpm)                | dB        | 1,2   | 3~100  | ≤56                                 | ≤58    | ≤60    | ≤60   | ≤63    | ≤63   | ≤65   | ≤67    | ≤70    |

### Gearbox Inertia

| Model No.                              |                      | Stage | Ratio | AB042 | AB060 | AB060A | AB090 | AB090A | AB115 | AB142 | AB180 | AB220 |
|----------------------------------------|----------------------|-------|-------|-------|-------|--------|-------|--------|-------|-------|-------|-------|
| Mass Moments of Inertia J <sub>1</sub> | kg • cm <sup>2</sup> | 1     | 3     | 0.03  | 0.16  | –      | 0.61  | –      | 3.25  | 9.21  | 28.98 | 69.61 |
|                                        |                      |       | 4     | 0.03  | 0.14  | –      | 0.48  | –      | 2.74  | 7.54  | 23.67 | 54.37 |
|                                        |                      |       | 5     | 0.03  | 0.13  | –      | 0.47  | –      | 2.71  | 7.42  | 23.29 | 53.27 |
|                                        |                      |       | 6     | 0.03  | 0.13  | –      | 0.45  | –      | 2.65  | 7.25  | 22.75 | 51.72 |
|                                        |                      |       | 7     | 0.03  | 0.13  | –      | 0.45  | –      | 2.62  | 7.14  | 22.48 | 50.97 |
|                                        |                      |       | 8     | 0.03  | 0.13  | –      | 0.44  | –      | 2.58  | 7.07  | 22.59 | 50.84 |
|                                        |                      |       | 9     | 0.03  | 0.13  | –      | 0.44  | –      | 2.57  | 7.04  | 22.53 | 50.63 |
|                                        |                      |       | 10    | 0.03  | 0.13  | –      | 0.44  | –      | 2.57  | 7.03  | 22.51 | 50.56 |
|                                        |                      | 2     | 15    | 0.03  | 0.03  | 0.13   | 0.13  | 0.47   | 0.47  | 2.71  | 7.42  | 23.29 |
|                                        |                      |       | 20    | 0.03  | 0.03  | 0.13   | 0.13  | 0.47   | 0.47  | 2.71  | 7.42  | 23.29 |
|                                        |                      |       | 25    | 0.03  | 0.03  | 0.13   | 0.13  | 0.47   | 0.47  | 2.71  | 7.42  | 23.29 |
|                                        |                      |       | 30    | 0.03  | 0.03  | 0.13   | 0.13  | 0.47   | 0.47  | 2.71  | 7.42  | 23.29 |
|                                        |                      |       | 35    | 0.03  | 0.03  | 0.13   | 0.13  | 0.47   | 0.47  | 2.71  | 7.42  | 23.29 |
|                                        |                      |       | 40    | 0.03  | 0.03  | 0.13   | 0.13  | 0.47   | 0.47  | 2.71  | 7.42  | 23.29 |
|                                        |                      |       | 45    | 0.03  | 0.03  | 0.13   | 0.13  | 0.47   | 0.47  | 2.71  | 7.42  | 23.29 |
|                                        |                      |       | 50    | 0.03  | 0.03  | 0.13   | 0.13  | 0.44   | 0.44  | 2.57  | 7.03  | 22.51 |
|                                        |                      |       | 60    | 0.03  | 0.03  | 0.13   | 0.13  | 0.44   | 0.44  | 2.57  | 7.03  | 22.51 |
|                                        |                      |       | 70    | 0.03  | 0.03  | 0.13   | 0.13  | 0.44   | 0.44  | 2.57  | 7.03  | 22.51 |
|                                        |                      |       | 80    | 0.03  | 0.03  | 0.13   | 0.13  | 0.44   | 0.44  | 2.57  | 7.03  | 22.51 |
|                                        |                      |       | 90    | 0.03  | 0.03  | 0.13   | 0.13  | 0.44   | 0.44  | 2.57  | 7.03  | 22.51 |
|                                        |                      |       | 100   | 0.03  | 0.03  | 0.13   | 0.13  | 0.44   | 0.44  | 2.57  | 7.03  | 22.51 |

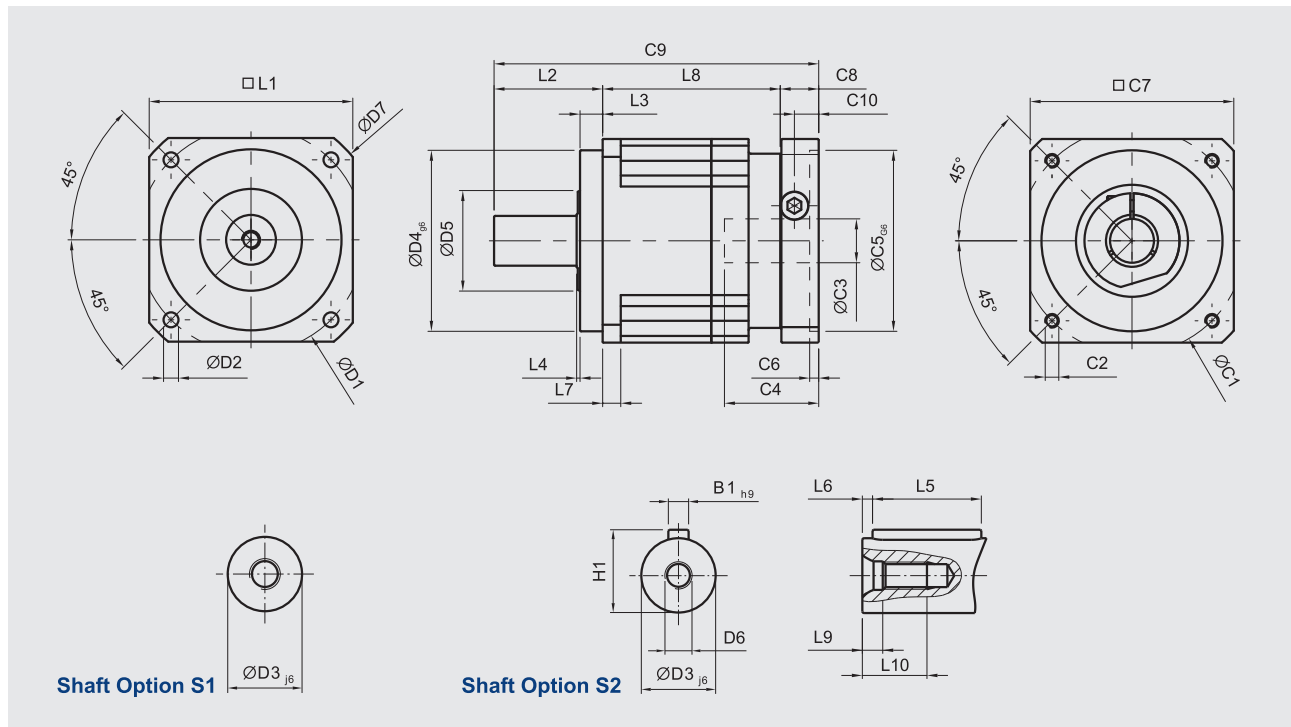
1. Ratio ( $i=N_{in}/N_{out}$ )

\* S1 service life 10,000 hrs

2.  $T_{2B} = 60\%$  of  $T_{2NOT}$

3. Applied to the output shaft center @ 100 rpm

# Dimensions (1-stage, Ratio i=3~10)



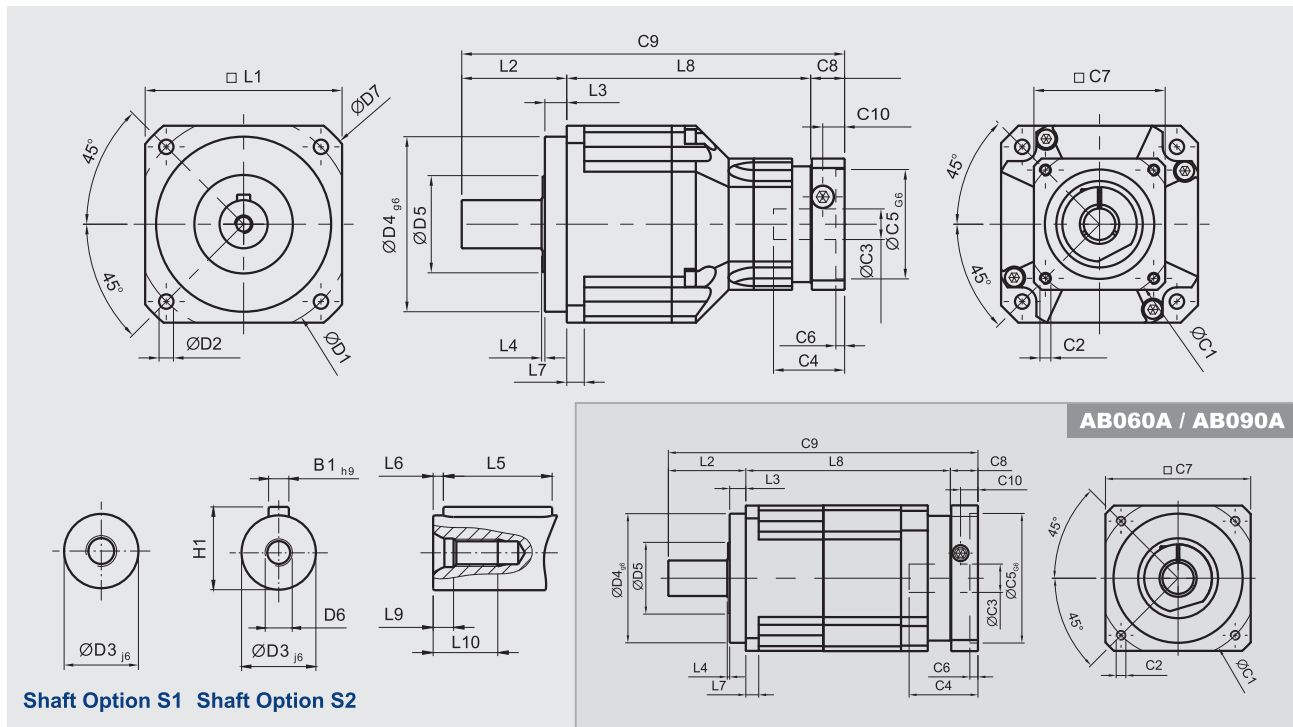
[unit: mm]

| Dimension                     | AB042     | AB060      | AB090      | AB115       | AB142      | AB180       | AB220       |
|-------------------------------|-----------|------------|------------|-------------|------------|-------------|-------------|
| D1                            | 50        | 70         | 100        | 130         | 165        | 215         | 250         |
| D2                            | 3.4       | 5.5        | 6.6        | 9           | 11         | 13          | 17          |
| D3 <sub>j6</sub>              | 13        | 16         | 22         | 32          | 40         | 55          | 75          |
| D4 <sub>g6</sub>              | 35        | 50         | 80         | 110         | 130        | 160         | 180         |
| D5                            | 22        | 45         | 65         | 95          | 75         | 95          | 115         |
| D6                            | M4 x 0.7P | M5 x 0.8P  | M8 x 1.25P | M12 x 1.75P | M16 x 2P   | M20 x 2.5P  | M20 x 2.5P  |
| D7                            | 56        | 80         | 116        | 152         | 185        | 240         | 292         |
| L1                            | 42        | 60         | 90         | 115         | 142        | 180         | 220         |
| L2                            | 26        | 37         | 48         | 65          | 97         | 105         | 138         |
| L3                            | 5.5       | 7          | 10         | 12          | 15         | 20          | 30          |
| L4                            | 1         | 1.5        | 1.5        | 2           | 3          | 3           | 3           |
| L5                            | 16        | 25         | 32         | 40          | 63         | 70          | 90          |
| L6                            | 2         | 2          | 3          | 5           | 5          | 6           | 7           |
| L7                            | 4         | 6          | 8          | 10          | 12         | 15          | 20          |
| L8                            | 31        | 61         | 78.5       | 102         | 119.5      | 154         | 163.5       |
| L9                            | 4.5       | 4.8        | 7.2        | 10          | 12         | 15          | 15          |
| L10                           | 10        | 12.5       | 19         | 28          | 36         | 42          | 42          |
| C1 <sup>4</sup>               | 46        | 70         | 100        | 130         | 165        | 215         | 235         |
| C2 <sup>4</sup>               | M4 x 0.7P | M5 x 0.8P  | M6 x 1P    | M8 x 1.25P  | M10 x 1.5P | M12 x 1.75P | M12 x 1.75P |
| C3 <sup>4</sup>               | ≤11       | *≤14 / ≤16 | ≤19 / ≤24  | ≤32         | ≤38        | ≤48         | ≤55         |
| C4 <sup>4</sup>               | 25        | 34         | 40         | 50          | 60         | 85          | 116         |
| C5 <sup>4</sup> <sub>G6</sub> | 30        | 50         | 80         | 110         | 130        | 180         | 200         |
| C6 <sup>4</sup>               | 3.5       | 8          | 4          | 5           | 6          | 6           | 6           |
| C7 <sup>4</sup>               | 42        | 60         | 90         | 115         | 142        | 190         | 220         |
| C8 <sup>4</sup>               | 29.5      | 19         | 17         | 19.5        | 22.5       | 29          | 63          |
| C9 <sup>4</sup>               | 86.5      | 117        | 143.5      | 186.5       | 239        | 288         | 364.5       |
| C10 <sup>4</sup>              | 8.75      | 13.5       | 10.75      | 13          | 15         | 20.75       | 53          |
| B1 <sub>h9</sub>              | 5         | 5          | 6          | 10          | 12         | 16          | 20          |
| H1                            | 15        | 18         | 24.5       | 35          | 43         | 59          | 79.5        |

4. C1~C10 are motor specific dimensions (metric std shown). Refer to Apexdyna.com and Design Tool to view your specific motor mounting system.  
\* AB060 ratio 5, 10 offers C3 ≤ 16 option.

# AB Series

## Dimensions (2-stage, Ratio i=15~100)



[unit: mm]

| Dimension                     | AB042     | AB060       | AB060A    | AB090                 | AB090A    | AB115       | AB142      | AB180      | AB220       |
|-------------------------------|-----------|-------------|-----------|-----------------------|-----------|-------------|------------|------------|-------------|
| D1                            | 50        | 70          |           | 100                   |           | 130         | 165        | 215        | 250         |
| D2                            | 3.4       | 5.5         |           | 6.6                   |           | 9           | 11         | 13         | 17          |
| D3 <sub>j6</sub>              | 13        | 16          |           | 22                    |           | 32          | 40         | 55         | 75          |
| D4 <sub>g6</sub>              | 35        | 50          |           | 80                    |           | 110         | 130        | 160        | 180         |
| D5                            | 22        | 45          |           | 65                    |           | 95          | 75         | 95         | 115         |
| D6                            | M4 x 0.7P | M5 x 0.8P   |           | M8 x 1.25P            |           | M12 x 1.75P | M16 x 2P   | M20 x 2.5P | M20 x 2.5P  |
| D7                            | 56        | 80          |           | 116                   |           | 152         | 185        | 240        | 292         |
| L1                            | 42        | 60          |           | 90                    |           | 115         | 142        | 180        | 220         |
| L2                            | 26        | 37          |           | 48                    |           | 65          | 97         | 105        | 138         |
| L3                            | 5.5       | 7           |           | 10                    |           | 12          | 15         | 20         | 30          |
| L4                            | 1         | 1.5         |           | 1.5                   |           | 2           | 3          | 3          | 3           |
| L5                            | 16        | 25          |           | 32                    |           | 40          | 63         | 70         | 90          |
| L6                            | 2         | 2           |           | 3                     |           | 5           | 5          | 6          | 7           |
| L7                            | 4         | 6           |           | 8                     |           | 10          | 12         | 15         | 20          |
| L8                            | 58.5      | 72          | 98        | 111.5                 | 126.5     | 143.5       | 176        | 209.5      | 248         |
| L9                            | 4.5       | 4.8         |           | 7.2                   |           | 10          | 12         | 15         | 15          |
| L10                           | 10        | 12.5        |           | 19                    |           | 28          | 36         | 42         | 42          |
| C1 <sup>5</sup>               | 46        | 46          | 70        | 70                    | 100       | 100         | 130        | 165        | 215         |
| C2 <sup>5</sup>               | M4 x 0.7P | M4 x 0.7P   | M5 x 0.8P | M5 x 0.8P             | M6 x 1P   | M6 x 1P     | M8 x 1.25P | M10 x 1.5P | M12 x 1.75P |
| C3 <sup>5</sup>               | ≤11       | * ≤11 / ≤12 | ≤14 / ≤16 | * ≤14 / ≤15.875 / ≤16 | ≤19 / ≤24 | ≤19 / ≤24   | ≤32        | ≤38        | ≤48         |
| C4 <sup>5</sup>               | 25        | 25          | 34        | 34                    | 40        | 40          | 50         | 60         | 85          |
| C5 <sup>5</sup> <sub>G6</sub> | 30        | 30          | 50        | 50                    | 80        | 80          | 110        | 130        | 180         |
| C6 <sup>5</sup>               | 3.5       | 3.5         | 8         | 8                     | 4         | 4           | 5          | 6          | 6           |
| C7 <sup>5</sup>               | 42        | 42          | 60        | 60                    | 90        | 90          | 115        | 142        | 190         |
| C8 <sup>5</sup>               | 29.5      | 29.5        | 19        | 19                    | 17        | 17          | 19.5       | 22.5       | 29          |
| C9 <sup>5</sup>               | 114       | 138.5       | 154       | 178.5                 | 191.5     | 225.5       | 292.5      | 337        | 415         |
| C10 <sup>5</sup>              | 8.75      | 8.75        | 13.5      | 13.5                  | 10.75     | 10.75       | 13         | 15         | 20.75       |
| B1 <sub>h9</sub>              | 5         | 5           |           | 6                     |           | 10          | 12         | 16         | 20          |
| H1                            | 15        | 18          |           | 24.5                  |           | 35          | 43         | 59         | 79.5        |

5. C1~C10 are motor specific dimensions (metric std shown). Refer to [Apexdyna.com](http://Apexdyna.com) and Design Tool to view your specific motor mounting system.  
 \* AB060 ratio 15~50 offers C3 ≤ 12 option. \* AB090 ratio 15~50 offers C3 ≤ 15.875 / ≤ 16 option.

# ABR Series

## Specifications

### Gearbox Performance

| Model No.                                            |           | Stage | Ratio <sup>1</sup> | ABR042                                 | ABR060 | ABR090 | ABR115 | ABR142 | ABR180 | ABR220 |       |
|------------------------------------------------------|-----------|-------|--------------------|----------------------------------------|--------|--------|--------|--------|--------|--------|-------|
| Nominal Output Torque T <sub>2N</sub>                | Nm        | 1     | 3                  | 9                                      | 36     | 90     | 195    | 342    | 588    | 1,140  |       |
|                                                      |           |       | 4                  | 12                                     | 48     | 120    | 260    | 520    | 1,040  | 1,680  |       |
|                                                      |           |       | 5                  | 15                                     | 60     | 150    | 325    | 650    | 1,200  | 2,000  |       |
|                                                      |           |       | 6                  | 18                                     | 55     | 150    | 310    | 600    | 1,100  | 1,900  |       |
|                                                      |           |       | 7                  | 19                                     | 50     | 140    | 300    | 550    | 1,100  | 1,800  |       |
|                                                      |           |       | 8                  | 17                                     | 45     | 120    | 260    | 500    | 1,000  | 1,600  |       |
|                                                      |           |       | 9                  | 14                                     | 40     | 100    | 230    | 450    | 900    | 1,500  |       |
|                                                      |           |       | 10                 | 14                                     | 40     | 100    | 230    | 450    | 900    | 1,500  |       |
|                                                      |           |       | 14                 | –                                      | 42     | 140    | 300    | 550    | 1,100  | 1,800  |       |
|                                                      |           |       | 20                 | –                                      | 40     | 100    | 230    | 450    | 900    | 1,500  |       |
|                                                      |           | 2     | 15                 | 14                                     | –      | –      | –      | –      | –      | –      |       |
|                                                      |           |       | 20                 | 14                                     | –      | –      | –      | –      | –      | –      |       |
|                                                      |           |       | 25                 | 15                                     | 60     | 150    | 325    | 650    | 1,200  | 2,000  |       |
|                                                      |           |       | 30                 | 20                                     | 55     | 150    | 310    | 600    | 1,100  | 1,900  |       |
|                                                      |           |       | 35                 | 19                                     | 50     | 140    | 300    | 550    | 1,100  | 1,800  |       |
|                                                      |           |       | 40                 | 17                                     | 45     | 120    | 260    | 500    | 1,000  | 1,600  |       |
|                                                      |           |       | 45                 | 14                                     | 40     | 100    | 230    | 450    | 900    | 1,500  |       |
|                                                      |           |       | 50                 | 14                                     | 60     | 100    | 230    | 650    | 1,200  | 2,000  |       |
|                                                      |           |       | 60                 | 20                                     | 55     | 150    | 310    | 600    | 1,100  | 1,900  |       |
|                                                      |           |       | 70                 | 19                                     | 50     | 140    | 300    | 550    | 1,100  | 1,800  |       |
|                                                      |           |       | 80                 | 17                                     | 45     | 120    | 260    | 500    | 1,000  | 1,600  |       |
|                                                      |           |       | 90                 | 14                                     | 40     | 100    | 230    | 450    | 900    | 1,500  |       |
|                                                      |           |       | 100                | 14                                     | 40     | 100    | 230    | 450    | 900    | 1,500  |       |
|                                                      |           |       | 120                | –                                      | –      | 150    | 310    | 600    | 1,100  | 1,900  |       |
|                                                      |           |       | 140                | –                                      | –      | 140    | 300    | 550    | 1,100  | 1,800  |       |
|                                                      |           |       | 160                | –                                      | –      | 120    | 260    | 550    | 1,000  | 1,600  |       |
|                                                      |           |       | 180                | –                                      | –      | 100    | 230    | 450    | 900    | 1,500  |       |
|                                                      |           |       | 200                | –                                      | –      | 100    | 230    | 450    | 900    | 1,500  |       |
| Emergency Stop Torque T <sub>2NOT</sub> <sup>2</sup> | Nm        |       | 1,2                | 3~200 3 times of Nominal Output Torque |        |        |        |        |        |        |       |
| Nominal Input Speed n <sub>1N</sub>                  | rpm       |       | 1,2                | 3~200                                  | 5,000  | 5,000  | 4,000  | 4,000  | 3,000  | 3,000  | 2,000 |
| Max. Input Speed n <sub>1B</sub>                     | rpm       | 1,2   | 3~200              | 10,000                                 | 10,000 | 8,000  | 8,000  | 6,000  | 6,000  | 4,000  |       |
| Micro Backlash P <sub>0</sub>                        | arcmin    | 1     | 3~20               | –                                      | –      | ≤2     | ≤2     | ≤2     | ≤2     | ≤2     |       |
|                                                      |           | 2     | 25~200             | –                                      | –      | ≤4     | ≤4     | ≤4     | ≤4     | ≤4     |       |
| Reduced Backlash P <sub>1</sub>                      | arcmin    | 1     | 3~20               | ≤4                                     | ≤4     | ≤4     | ≤4     | ≤4     | ≤4     | ≤4     |       |
|                                                      |           | 2     | 25~200             | ≤7                                     | ≤7     | ≤7     | ≤7     | ≤7     | ≤7     | ≤7     |       |
| Standard Backlash P <sub>2</sub>                     | arcmin    | 1     | 3~20               | ≤6                                     | ≤6     | ≤6     | ≤6     | ≤6     | ≤6     | ≤6     |       |
|                                                      |           | 2     | 25~200             | ≤9                                     | ≤9     | ≤9     | ≤9     | ≤9     | ≤9     | ≤9     |       |
| Torsional Rigidity                                   | Nm/arcmin | 1,2   | 3~200              | 3                                      | 7      | 14     | 25     | 50     | 145    | 225    |       |
| Max. Radial Load F <sub>2rB</sub> <sup>3</sup>       | N         | 1,2   | 3~200              | 780                                    | 1,530  | 3,250  | 6,700  | 9,400  | 14,500 | 50,000 |       |
| Max. Axial Load F <sub>2a1B</sub> <sup>3</sup>       | N         | 1,2   | 3~200              | 350                                    | 630    | 1,300  | 3,000  | 4,000  | 6,200  | 35,000 |       |
| Max. Axial Load F <sub>2a2B</sub> <sup>3</sup>       | N         | 1,2   | 3~200              | 390                                    | 765    | 1,625  | 3,350  | 4,700  | 7,250  | 25,000 |       |
| Service Life                                         | hr        | 1,2   | 3~200              | 20,000*                                |        |        |        |        |        |        |       |
| Efficiency η                                         | %         | 1     | 3~20               | ≥95%                                   |        |        |        |        |        |        |       |
|                                                      |           | 2     | 25~200             | ≥92%                                   |        |        |        |        |        |        |       |
| Weight                                               | kg        | 1     | 3~20               | 0.9                                    | 2.1    | 6.4    | 13     | 24.5   | 51     | 83     |       |
|                                                      |           | 2     | 25~200             | 1.2                                    | 1.5    | 7.8    | 14.2   | 27.5   | 54     | 95     |       |
| Operating Temp                                       | °C        | 1,2   | 3~200              | -10°C~+90°C                            |        |        |        |        |        |        |       |
| Lubrication                                          |           | 1,2   | 3~200              | synthetic gear grease (NYOGEL 792D)    |        |        |        |        |        |        |       |
| Degree of Gearbox Protection                         |           | 1,2   | 3~200              | IP65                                   |        |        |        |        |        |        |       |
| Mounting Position                                    |           | 1,2   | 3~200              | all directions                         |        |        |        |        |        |        |       |
| Noise Level (n <sub>1</sub> =3000rpm)                | dB        | 1,2   | 3~200              | ≤61                                    | ≤63    | ≤65    | ≤68    | ≤70    | ≤72    | ≤74    |       |

### Gearbox Inertia

| Model No.                              |                      | Stage | Ratio <sup>1</sup> | ABR042 | ABR060 | ABR090 | ABR115 | ABR142 | ABR180 | ABR220 |
|----------------------------------------|----------------------|-------|--------------------|--------|--------|--------|--------|--------|--------|--------|
| Mass Moments of Inertia J <sub>1</sub> | kg • cm <sup>2</sup> | 1     | 3~10               | 0.09   | 0.35   | 2.25   | 6.84   | 23.4   | 68.9   | 135.4  |
|                                        |                      |       | 14                 | —      | 0.07   | 1.87   | 6.25   | 21.8   | 65.6   | 119.8  |
|                                        |                      |       | 20                 | —      | 0.07   | 1.87   | 6.25   | 21.8   | 65.6   | 119.8  |
|                                        |                      | 2     | 15                 | 0.09   | —      | —      | —      | —      | —      | —      |
|                                        |                      |       | 20                 | 0.09   | —      | —      | —      | —      | —      | —      |
|                                        |                      |       | 25~100             | 0.09   | 0.09   | 0.35   | 2.25   | 6.84   | 23.4   | 68.9   |
|                                        |                      |       | 120~200            | —      | —      | 0.31   | 1.87   | 6.25   | 21.8   | 65.6   |

1. Ratio ( $i=N_{in}/N_{out}$ )

2.  $T_{2B}$  = 60% of  $T_{2NOT}$

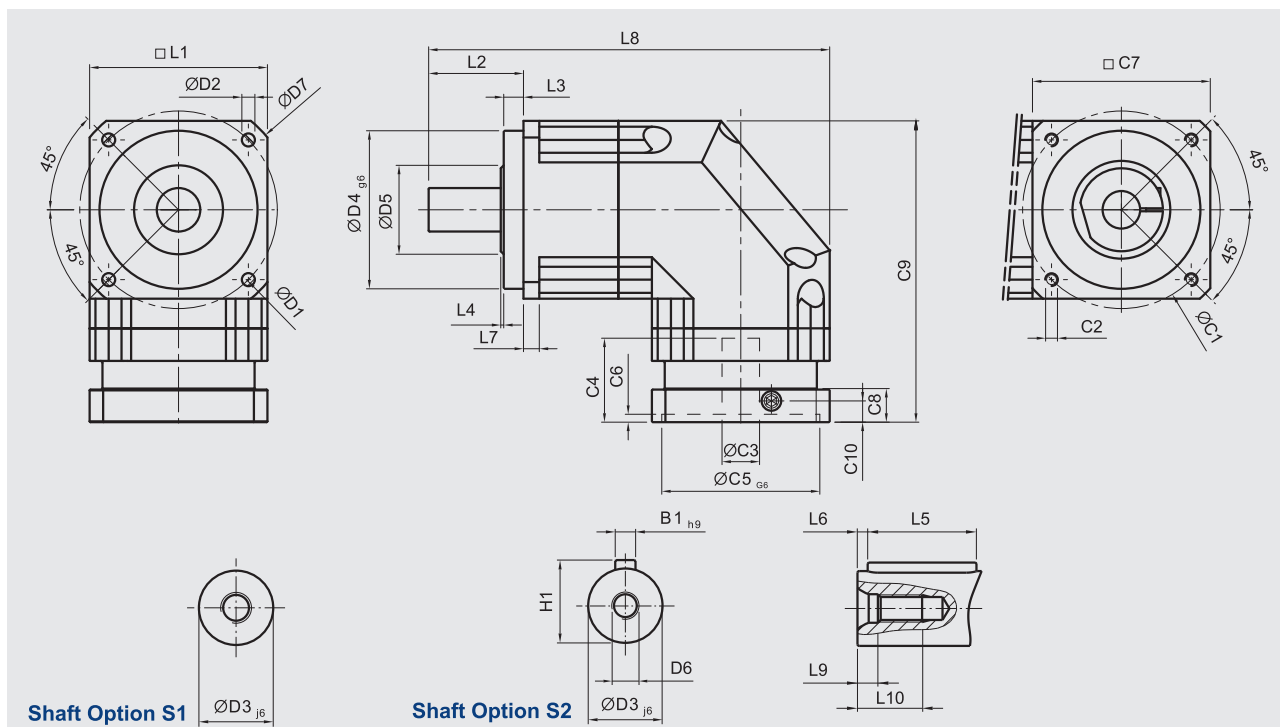
3. Applied to the output shaft center @ 100 rpm

\* S1 service life 10,000 hrs



# ABR Series

## Dimensions (1-stage, Ratio $i=3\sim20$ )

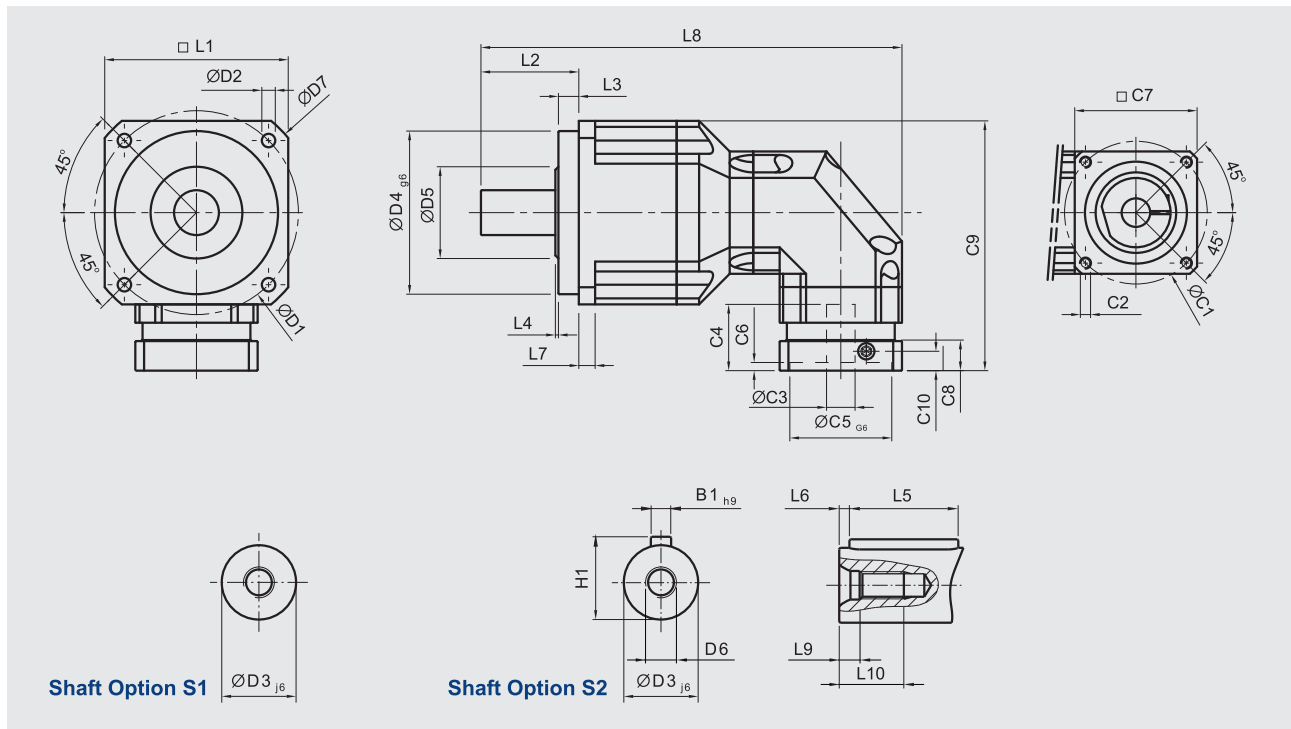


[unit: mm]

| Dimension             | ABR042    | ABR060              | ABR090              | ABR115      | ABR142     | ABR180      | ABR220      |
|-----------------------|-----------|---------------------|---------------------|-------------|------------|-------------|-------------|
| D1                    | 50        | 70                  | 100                 | 130         | 165        | 215         | 250         |
| D2                    | 3.4       | 5.5                 | 6.6                 | 9           | 11         | 13          | 17          |
| D3 $j_6$              | 13        | 16                  | 22                  | 32          | 40         | 55          | 75          |
| D4 $g_6$              | 35        | 50                  | 80                  | 110         | 130        | 160         | 180         |
| D5                    | 22        | 45                  | 65                  | 95          | 75         | 95          | 115         |
| D6                    | M4 x 0.7P | M5 x 0.8P           | M8 x 1.25P          | M12 x 1.75P | M16 x 2P   | M20 x 2.5P  | M20 x 2.5P  |
| D7                    | 56        | 80                  | 116                 | 152         | 185        | 240         | 292         |
| L1                    | 42        | 60                  | 90                  | 115         | 142        | 180         | 220         |
| L2                    | 26        | 37                  | 48                  | 65          | 97         | 105         | 138         |
| L3                    | 5.5       | 7                   | 10                  | 12          | 15         | 20          | 30          |
| L4                    | 1         | 1.5                 | 1.5                 | 2           | 3          | 3           | 3           |
| L5                    | 16        | 25                  | 32                  | 40          | 63         | 70          | 90          |
| L6                    | 2         | 2                   | 3                   | 5           | 5          | 6           | 7           |
| L7                    | 4         | 6                   | 8                   | 10          | 12         | 15          | 20          |
| L8                    | 111.5     | 145                 | 203                 | 259         | 333        | 394         | 484         |
| L9                    | 4.5       | 4.8                 | 7.2                 | 10          | 12         | 15          | 15          |
| L10                   | 10        | 12.5                | 19                  | 28          | 36         | 42          | 42          |
| C1 <sup>4</sup>       | 46        | 70                  | 100                 | 130         | 165        | 215         | 235         |
| C2 <sup>4</sup>       | M4 x 0.7P | M5 x 0.8P           | M6 x 1P             | M8 x 1.25P  | M10 x 1.5P | M12 x 1.75P | M12 x 1.75P |
| C3 <sup>4</sup>       | $\leq 11$ | $\leq 14 / \leq 16$ | $\leq 19 / \leq 24$ | $\leq 32$   | $\leq 38$  | $\leq 48$   | $\leq 55$   |
| C4 <sup>4</sup>       | 25        | 34                  | 40                  | 50          | 60         | 85          | 116         |
| C5 <sup>4</sup> $G_6$ | 30        | 50                  | 80                  | 110         | 130        | 180         | 200         |
| C6 <sup>4</sup>       | 3.5       | 8                   | 4                   | 5           | 6          | 6           | 6           |
| C7 <sup>4</sup>       | 42        | 60                  | 90                  | 115         | 142        | 190         | 220         |
| C8 <sup>4</sup>       | 29.5      | 19                  | 17                  | 19.5        | 22.5       | 29          | 63          |
| C9 <sup>4</sup>       | 90.5      | 111.5               | 152.5               | 191.5       | 235.5      | 303.5       | 378.5       |
| C10 <sup>4</sup>      | 8.75      | 13.5                | 10.75               | 13          | 15         | 20.75       | 53          |
| B1 $h_9$              | 5         | 5                   | 6                   | 10          | 12         | 16          | 20          |
| H1                    | 15        | 18                  | 24.5                | 35          | 43         | 59          | 79.5        |

4. C1~C10 are motor specific dimensions (metric std shown). Refer to Apexdyna.com and Design Tool to view your specific motor mounting system.

# Dimensions (2-stage, Ratio i= 15~200)



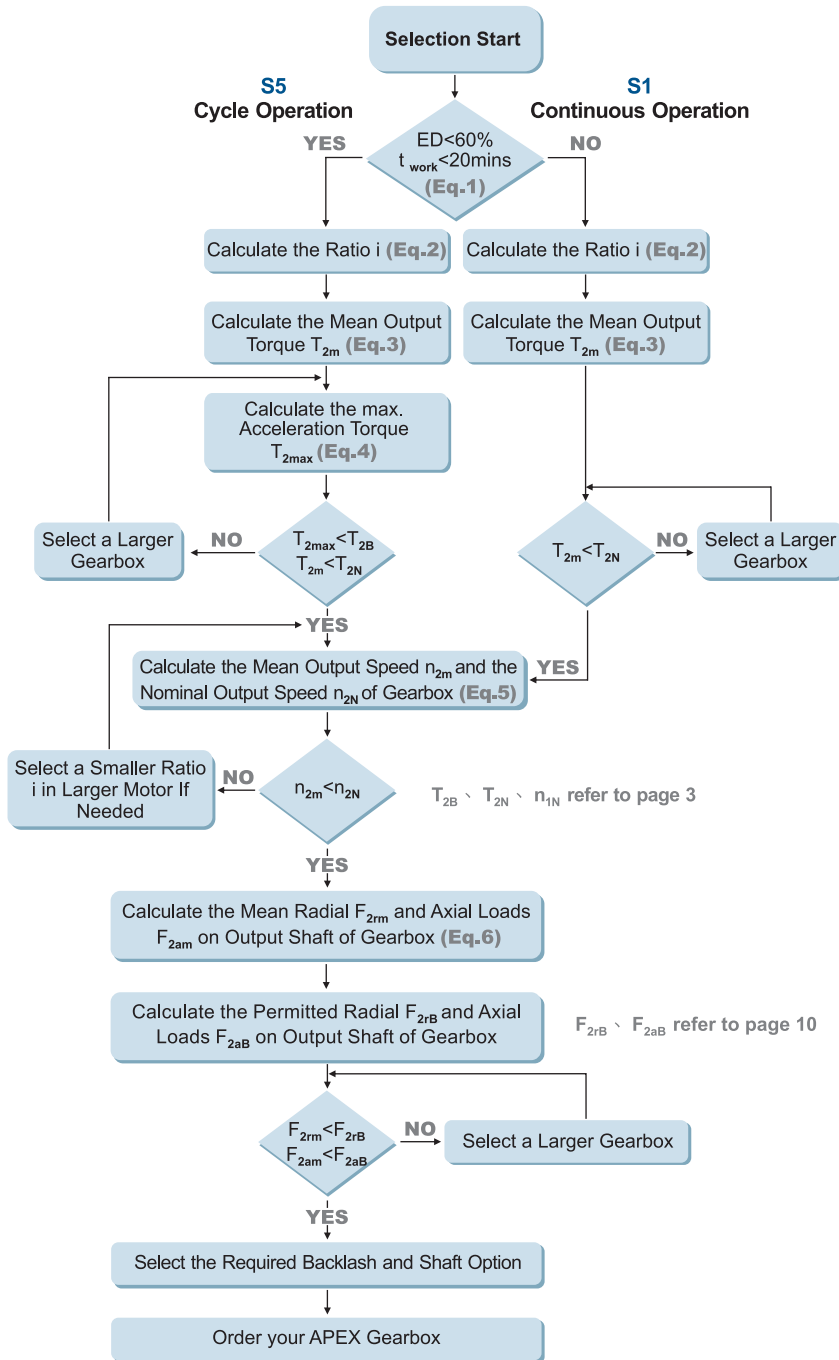
[unit: mm]

| Dimension          | ABR042    | ABR060    | ABR090              | ABR115      | ABR142     | ABR180     | ABR220      |
|--------------------|-----------|-----------|---------------------|-------------|------------|------------|-------------|
| D1                 | 50        | 70        | 100                 | 130         | 165        | 215        | 250         |
| D2                 | 3.4       | 5.5       | 6.6                 | 9           | 11         | 13         | 17          |
| D3 <sup>j6</sup>   | 13        | 16        | 22                  | 32          | 40         | 55         | 75          |
| D4 <sup>g6</sup>   | 35        | 50        | 80                  | 110         | 130        | 160        | 180         |
| D5                 | 22        | 45        | 65                  | 95          | 75         | 95         | 115         |
| D6                 | M4 x 0.7P | M5 x 0.8P | M8 x 1.25P          | M12 x 1.75P | M16 x 2P   | M20 x 2.5P | M20 x 2.5P  |
| D7                 | 56        | 80        | 116                 | 152         | 185        | 240        | 292         |
| L1                 | 42        | 60        | 90                  | 115         | 142        | 180        | 220         |
| L2                 | 26        | 37        | 48                  | 65          | 97         | 105        | 138         |
| L3                 | 5.5       | 7         | 10                  | 12          | 15         | 20         | 30          |
| L4                 | 1         | 1.5       | 1.5                 | 2           | 3          | 3          | 3           |
| L5                 | 16        | 25        | 32                  | 40          | 63         | 70         | 90          |
| L6                 | 2         | 2         | 3                   | 5           | 5          | 6          | 7           |
| L7                 | 4         | 6         | 8                   | 10          | 12         | 15         | 20          |
| L8                 | 139       | 163.5     | 206.5               | 285         | 365        | 431        | 521         |
| L9                 | 4.5       | 4.8       | 7.2                 | 10          | 12         | 15         | 15          |
| L10                | 10        | 12.5      | 19                  | 28          | 36         | 42         | 42          |
| C1 <sup>5</sup>    | 46        | 46        | 70                  | 100         | 130        | 165        | 215         |
| C2 <sup>5</sup>    | M4 x 0.7P | M4 x 0.7P | M5 x 0.8P           | M6 x 1P     | M8 x 1.25P | M10 x 1.5P | M12 x 1.75P |
| C3 <sup>5</sup>    | ≤11       | ≤11 / ≤12 | ≤14 / ≤15.875 / ≤16 | ≤19 / ≤24   | ≤32        | ≤38        | ≤48         |
| C4 <sup>5</sup>    | 25        | 25        | 34                  | 40          | 50         | 60         | 85          |
| C5 <sup>5 G6</sup> | 30        | 30        | 50                  | 80          | 110        | 130        | 180         |
| C6 <sup>5</sup>    | 3.5       | 3.5       | 8                   | 4           | 5          | 6          | 6           |
| C7 <sup>5</sup>    | 42        | 42        | 60                  | 90          | 115        | 142        | 190         |
| C8 <sup>5</sup>    | 29.5      | 29.5      | 19                  | 17          | 19.5       | 22.5       | 29          |
| C9 <sup>5</sup>    | 90.5      | 99.5      | 126.5               | 165         | 205        | 254.5      | 323.5       |
| C10 <sup>5</sup>   | 8.75      | 8.75      | 13.5                | 10.75       | 13         | 15         | 20.75       |
| B1 <sup>h9</sup>   | 5         | 5         | 6                   | 10          | 12         | 16         | 20          |
| H1                 | 15        | 18        | 24.5                | 35          | 43         | 59         | 79.5        |

5. C1~C10 are motor specific dimensions (metric std shown). Refer to Apexdyna.com and Design Tool to view your specific motor mounting system.

# Selection of the Optimum Gearbox

## Selection of the Optimum Gearbox



### Recommended (for S5 Cycle Operation)

The general design is given for

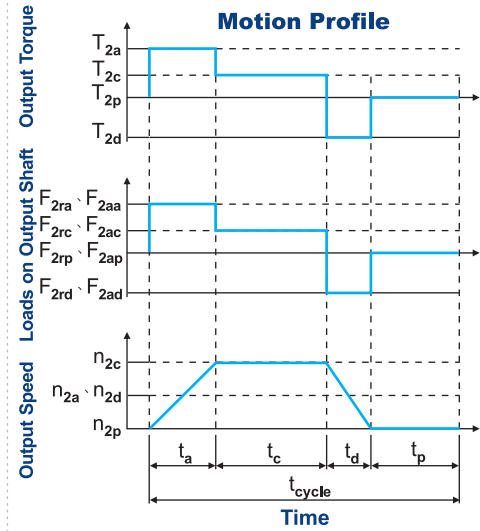
$$\frac{J_L}{i^2} \leq 4 \times J_m$$

The optimal design is given for

$$\frac{J_L}{i^2} \cong J_m$$

$J_L$  Load Inertia

$J_m$  Motor Inertia



$$1. ED = \frac{t_a + t_c + t_d}{t_{cycle}} \times 100\%, t_{work} = t_a + t_c + t_d$$

Index : a. Acceleration, c. Constant,

d. Deceleration, p. Pause

(Eq.1)

$$2. i \cong \frac{n_m}{n_{work}}$$

$n_m$  Output Speed of the Motor

$n_{work}$  Working Speed

(Eq.2)

$$3. T_{2m} = 3 \sqrt{\frac{n_{2a} \times t_a \times T_{2a}^3 + n_{2c} \times t_c \times T_{2c}^3 + n_{2d} \times t_d \times T_{2d}^3}{n_{2a} \times t_a + n_{2c} \times t_c + n_{2d} \times t_d}}$$

(Eq.3)

$$4. T_{2max} = T_{mB} \times i \times k_s \times \eta$$

where  $K_s$  is

| $K_s$ | No. of Cycles / hr |
|-------|--------------------|
| 1.0   | 0 ~ 1,000          |
| 1.1   | 1,000 ~ 1,500      |
| 1.3   | 1,500 ~ 2,000      |
| 1.6   | 2,000 ~ 3,000      |
| 1.8   | 3,000 ~ 5,000      |

$T_{mB}$  Max. Output Torque of the Motor

$\eta$  Efficiency of the Gearbox

(Eq.4)

$$5. n_{2a} = n_{2d} = \frac{1}{2} \times n_{2c}$$

$$n_{2m} = \frac{n_{2a} \times t_a + n_{2c} \times t_c + n_{2d} \times t_d}{t_a + t_c + t_d}$$

$$n_{2N} = \frac{n_{1N}}{i}$$

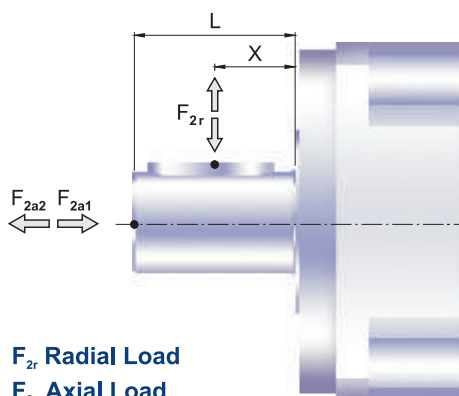
(Eq.5)

$$6. F_{2rm} = 3 \sqrt{\frac{n_{2a} \times t_a \times F_{2ra}^3 + n_{2c} \times t_c \times F_{2rc}^3 + n_{2d} \times t_d \times F_{2rd}^3}{n_{2a} \times t_a + n_{2c} \times t_c + n_{2d} \times t_d}}$$

$$F_{2am} = 3 \sqrt{\frac{n_{2a} \times t_a \times F_{2aa}^3 + n_{2c} \times t_c \times F_{2ac}^3 + n_{2d} \times t_d \times F_{2ad}^3}{n_{2a} \times t_a + n_{2c} \times t_c + n_{2d} \times t_d}}$$

(Eq.6)

# Permitted Radial and Axial Loads on Output Shaft of the Gearbox



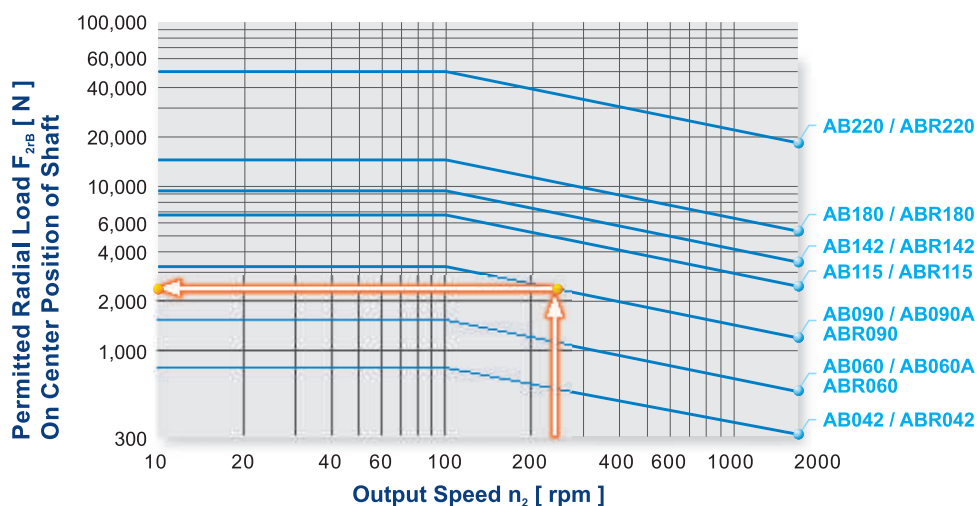
The permitted radial and axial loads on output shaft of the gearbox depend on the design of the gearbox supporting bearings.

APEX use the extension straddle oversized ball bearing design.

It can take heavy load from both axes.

$F_{2r}$  Radial Load

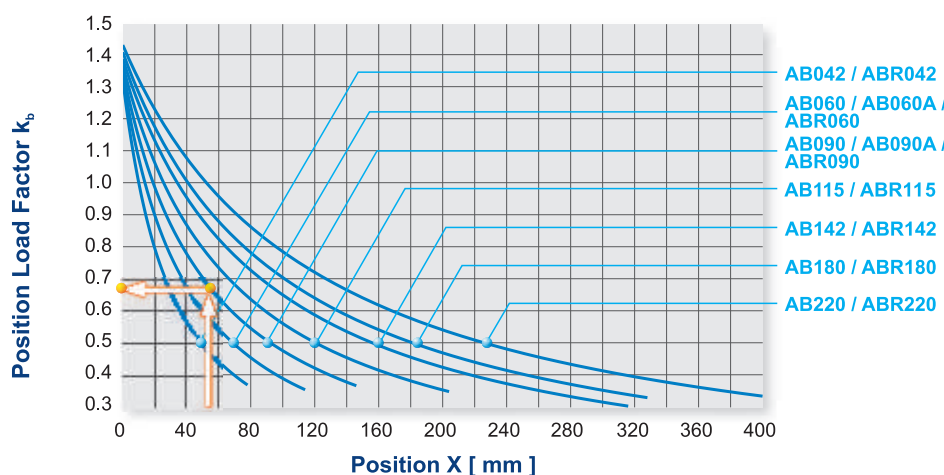
$F_{2a}$  Axial Load



If radial force  $F_{2r}$  exert on the center of the output shaft  $X=1/2 \times L$ .

Under various operating condition the lifetime is over 20,000 hours\*.

The permitted radial load is given on left diagram.



If radial force  $F_{2r}$  not exert on the center of the output shaft  $X < 1/2 \times L$  or  $X > 1/2 \times L$ .

The permitted radial and axial load can be calculated by the position load factor  $k_b$  on the left diagram.

\* S1 service life 10,000 hrs

# Ordering Code

## AB Series

**AB090**

–

**010**

–

**S1**

–

**P1**

/

**MOTOR**

### Gearbox Size:

AB042, AB060, AB060A, AB090, AB090A  
AB115, AB142, AB180, AB220

### Shaft Option:

S1: Smooth Output Shaft  
S2: Output Shaft with Key

### Motor Designation:

Manufacturer Type  
And Model

### Ratio:

1 Stage: 3, 4, 5, 6, 7, 8, 9, 10  
2 Stage: 15, 20, 25, 30, 35, 40, 45, 50, 60, 70,  
80, 90, 100

### Backlash:

P0: Micro Backlash  
P1: Reduced Backlash  
P2: Standard Backlash

**Ordering Example: AB090-010-S1-P1 / SIEMENS 1FT6 041-4AF71**

## ABR Series

**ABR090**

–

**010**

–

**S1**

–

**P1**

/

**MOTOR**

### Gearbox Size:

ABR042, ABR060, ABR090  
ABR115, ABR142, ABR180,  
ABR220

### Shaft Option:

S1: Smooth Output Shaft  
S2: Output Shaft with Key

### Motor Designation:

Manufacturer Type  
And Model

### Ratio:

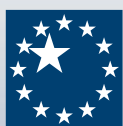
1 Stage: 3, 4, 5, 6, 7, 8, 9, 10, 14, 20  
2 Stage: 15, 20, 25, 30, 35, 40, 45, 50, 60, 70,  
80, 90, 100, 120, 140, 160, 180, 200

### Backlash:

P0: Micro Backlash  
P1: Reduced Backlash  
P2: Standard Backlash

**Ordering Example: ABR090-010-S1-P1 / SIEMENS 1FT6 041-4AF71**

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