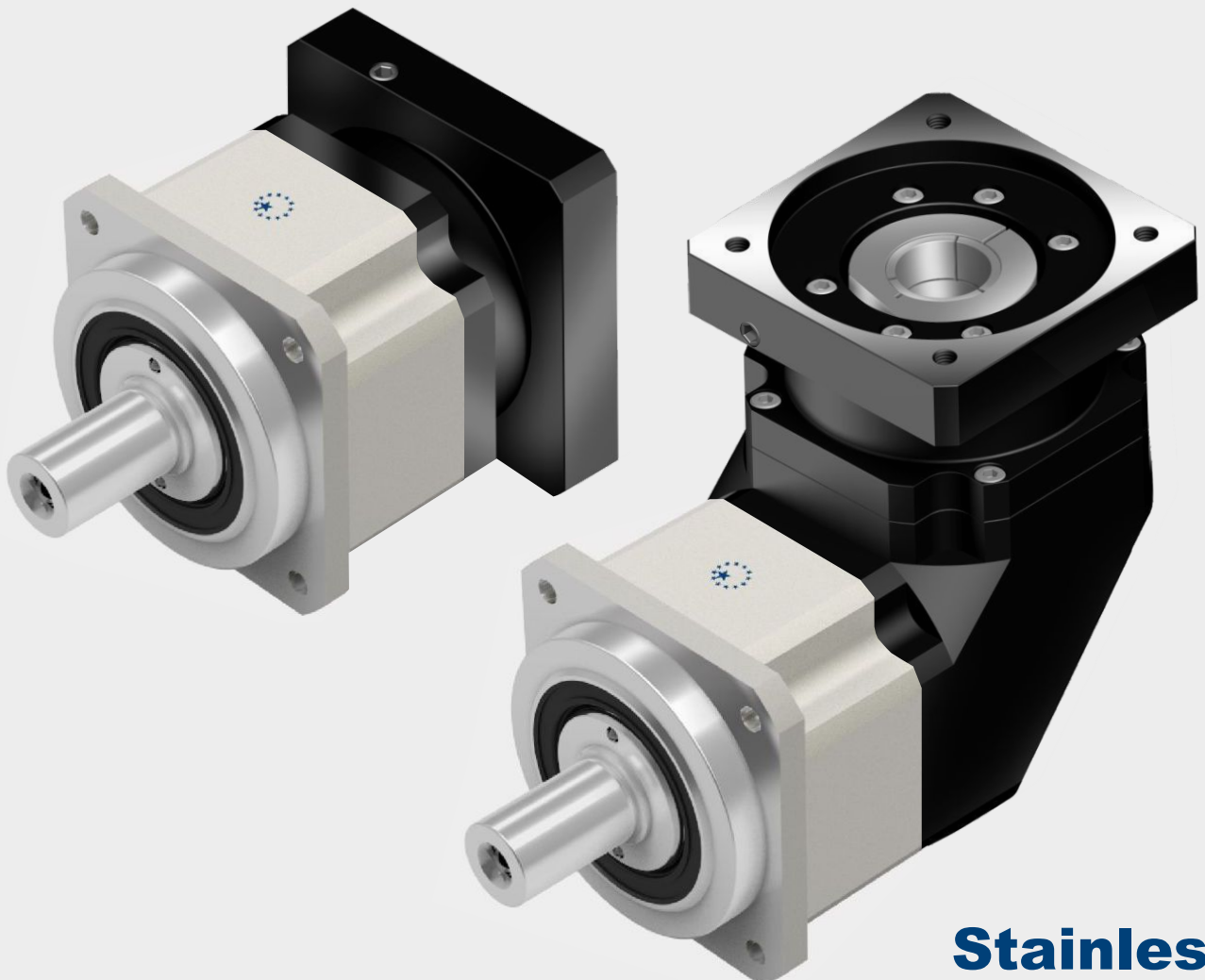




**APEX DYNAMICS, INC.**

**HIGH PRECISION  
PLANETARY GEARBOX**

**AB / ABR Series**



**Stainless**



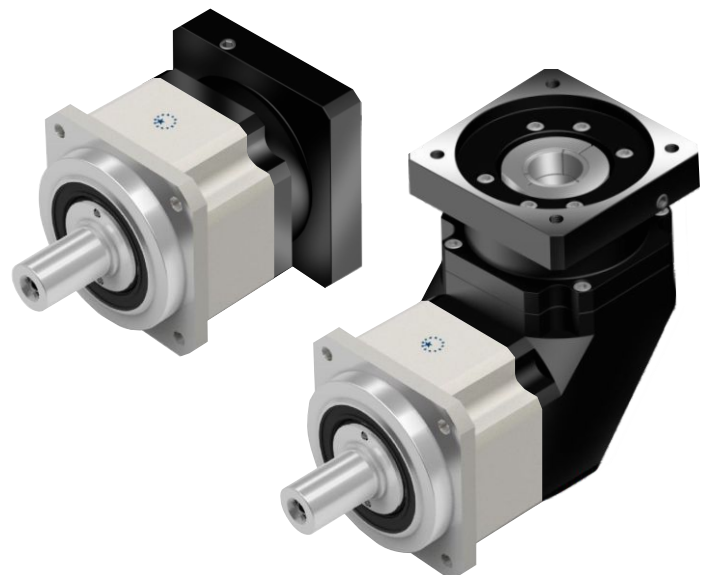
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Based on more than twenty years of accumulated manufacturing and marketing experience, plus the highest level of technical production capabilities, Apex Dynamics, Inc. designs and builds technically advanced, high speed, low backlash servo application planetary gearboxes. Our Break through patented technology (over 6 patents), provides the customer with the optimum high precision helical reducer at a reasonable price. We are continuously improving processes, finding proper and effective methods to provide customers new solutions for difficult applications, and developing new products.

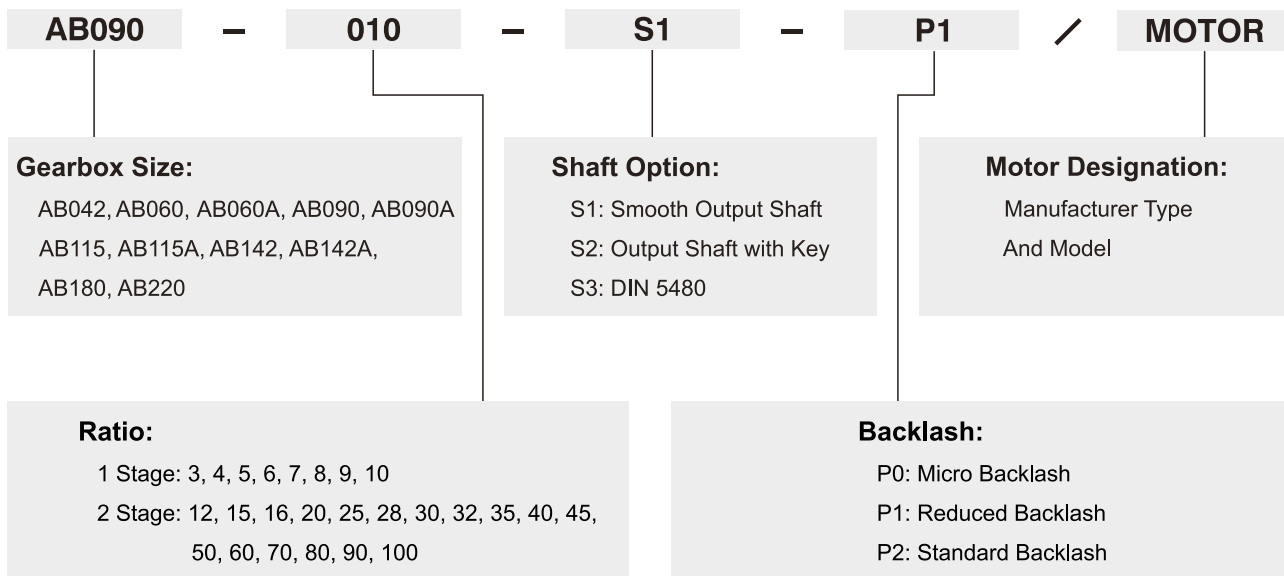
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**APEX**

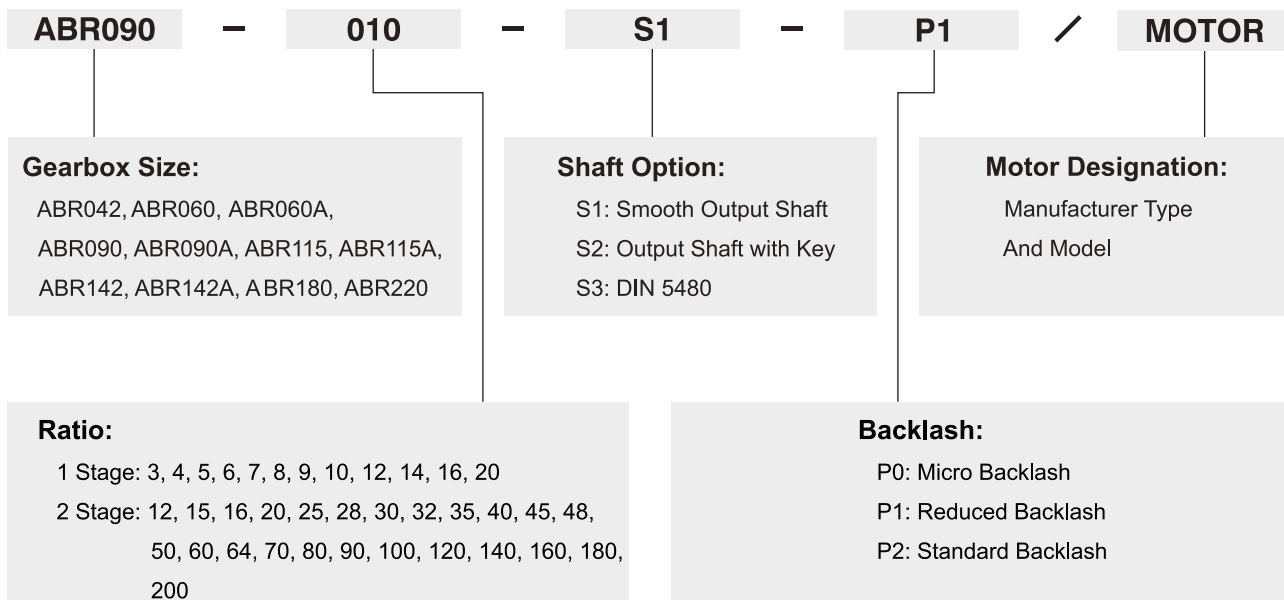


# AB Series



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

# ABR Series



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



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# Specifications / AB Series

## Gearbox Performance

| Model No.                              | Stage     | Ratio <sup>(1)</sup> | AB042  | AB060                            | AB060A | AB090  | AB090A | AB115 | AB115A | AB142 | AB142A | AB180 | AB220  |        |
|--|-----------|----------------------|--------|----------------------------------|--------|--------|--------|-------|--------|-------|--------|-------|--------|--------|
| Nominal Output Torque $T_{2N}$         | 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                    | 12     | 19                               | 50     | 50     | 140    | 140   | 290    | 290   | 542    | 542   | 1,050  | 1,700  |
|  |           |                      | 15     | 20                               | 55     | 55     | 130    | 130   | 208    | 208   | 342    | 342   | 588    | 1,140  |
|  | 16        |                      | 19     | 50                               | 50     | 140    | 140    | 290   | 290    | 542   | 542    | 1,050 | 1,700  |        |
|  | 20        |                      | 19     | 50                               | 50     | 140    | 140    | 290   | 290    | 542   | 542    | 1,050 | 1,700  |        |
|  | 25        |                      | 22     | 60                               | 60     | 160    | 160    | 330   | 330    | 650   | 650    | 1,200 | 2,000  |        |
|  | 28        |                      | 19     | 50                               | 50     | 140    | 140    | 300   | 300    | 550   | 550    | 1,100 | 1,800  |        |
|  | 30        |                      | 20     | 55                               | 55     | 150    | 150    | 310   | 310    | 600   | 600    | 1,100 | 1,900  |        |
|  | 32        |                      | 17     | 45                               | 45     | 120    | 120    | 260   | 260    | 500   | 500    | 1,000 | 1,600  |        |
|  | 35        |                      | 19     | 50                               | 50     | 140    | 140    | 300   | 300    | 550   | 550    | 1,100 | 1,800  |        |
|  | 40        |                      | 17     | 45                               | 45     | 120    | 120    | 260   | 260    | 500   | 500    | 1,000 | 1,600  |        |
|  | 45        | 14                   | 40     | 40                               | 100    | 100    | 230    | 230   | 450    | 450   | 900    | 1,500 |        |        |
|  | 50        | 22                   | 60     | 60                               | 160    | 160    | 330    | 330   | 650    | 650   | 1,200  | 2,000 |        |        |
| 60                                     | 20        | 55                   | 55     | 150                              | 150    | 310    | 310    | 600   | 600    | 1,100 | 1,900  |       |        |        |
| 70                                     | 19        | 50                   | 50     | 140                              | 140    | 300    | 300    | 550   | 550    | 1,100 | 1,800  |       |        |        |
| 80                                     | 17        | 45                   | 45     | 120                              | 120    | 260    | 260    | 500   | 500    | 1,000 | 1,600  |       |        |        |
| 90                                     | 14        | 40                   | 40     | 100                              | 100    | 230    | 230    | 450   | 450    | 900   | 1,500  |       |        |        |
| 100                                    | 14        | 40                   | 40     | 100                              | 100    | 230    | 230    | 450   | 450    | 900   | 1,500  |       |        |        |
| Emergency Stop Torque $T_{2NOT}^{(2)}$ | Nm        | 1,2                  | 3~100  | 3 times of Nominal Output Torque |        |        |        |       |        |       |        |       |        |        |
| Nominal Input Speed $n_{1N}$           | rpm       | 1,2                  | 3~100  | 5,000                            | 5,000  | 5,000  | 4,000  | 4,000 | 4,000  | 4,000 | 3,000  | 3,000 | 3,000  | 2,000  |
| Max. Input Speed $n_{1B}$              | rpm       | 1,2                  | 3~100  | 10,000                           | 10,000 | 10,000 | 8,000  | 8,000 | 8,000  | 8,000 | 6,000  | 6,000 | 6,000  | 4,000  |
| Micro Backlash P0                      | arcmin    | 1                    | 3~10   | -                                | -      | -      | ≤1     | -     | ≤1     | -     | ≤1     | -     | ≤1     | ≤1     |
|  |           | 2                    | 12~100 | -                                | -      | -      | -      | -     | ≤3     | ≤3    | ≤3     | ≤3    | ≤3     | ≤3     |
| Reduced Backlash P1                    | arcmin    | 1                    | 3~10   | ≤3                               | ≤3     | -      | ≤3     | -     | ≤3     | -     | ≤3     | -     | ≤3     | ≤3     |
|  |           | 2                    | 12~100 | ≤5                               | ≤5     | ≤5     | ≤5     | ≤5    | ≤5     | ≤5    | ≤5     | ≤5    | ≤5     | ≤5     |
| Standard Backlash P2                   | arcmin    | 1                    | 3~10   | ≤5                               | ≤5     | -      | ≤5     | -     | ≤5     | -     | ≤5     | -     | ≤5     | ≤5     |
|  |           | 2                    | 12~100 | ≤7                               | ≤7     | ≤7     | ≤7     | ≤7    | ≤7     | ≤7    | ≤7     | ≤7    | ≤7     | ≤7     |
| Torsional Rigidity                     | Nm/arcmin | 1,2                  | 3~100  | 3                                | 7      | 7      | 14     | 14    | 25     | 25    | 50     | 50    | 145    | 225    |
| Max. Radial Load $F_{2rB}^{(3)}$       | N         | 1,2                  | 3~100  | 780                              | 1,530  | 1,530  | 3,250  | 3,250 | 6,700  | 6,700 | 9,400  | 9,400 | 14,500 | 50,000 |
| Max. Axial Load $F_{2aB}^{(3)}$        | N         | 1,2                  | 3~100  | 390                              | 765    | 765    | 1,625  | 1,625 | 3,350  | 3,350 | 4,700  | 4,700 | 7,250  | 25,000 |
| Max. Tilting Moment $M_{2K}$           | Nm        | 1,2                  | 3~100  | 25                               | 70     | 70     | 200    | 200   | 550    | 550   | 990    | 990   | 1,760  | 7,630  |
| Efficiency $\eta$                      | %         | 1                    | 3~10   | ≥97%                             |        |        |        |       |        |       |        |       |        |        |
|  |           | 2                    | 12~100 | ≥94%                             |        |        |        |       |        |       |        |       |        |        |
| Weight                                 | kg        | 1                    | 3~10   | 0.6                              | 1.3    | -      | 3.7    | -     | 7.8    | -     | 13     | -     | 26     | 45     |
|  |           | 2                    | 12~100 | 0.8                              | 1.5    | 1.9    | 4.1    | 5.3   | 9      | 11.4  | 17.5   | 20.7  | 32     | 57     |
| Operating Temp                         | °C        | 1,2                  | 3~100  | -10°C~90°C                       |        |        |        |       |        |       |        |       |        |        |
| Lubrication                            |           | 1,2                  | 3~100  | Synthetic lubrication oils       |        |        |        |       |        |       |        |       |        |        |
| Degree of Gearbox Protection           |           | 1,2                  | 3~100  | IP65                             |        |        |        |       |        |       |        |       |        |        |
| Mounting Position                      |           | 1,2                  | 3~100  | all directions                   |        |        |        |       |        |       |        |       |        |        |
| Noise <sup>(4)</sup>                   | dB(A)     | 1,2                  | 3~100  | ≤56                              | ≤58    | ≤60    | ≤60    | ≤63   | ≤63    | ≤65   | ≤65    | ≤67   | ≤67    | ≤70    |

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

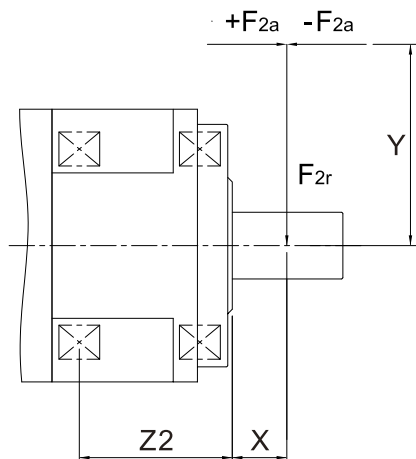
(2) Max. acceleration torque  $T_{2B} = 60\%$  of  $T_{2NOT}$

(3) Applied to the output shaft center at 100 rpm

(4) The dB values are measured by gearbox with ratio 10 (1-stage) or ratio 100 (2-stage), no loading at 3,000 RPM or at the respective Nominal Input Speed by bigger model size.

By lower ratio and/or higher RPM, the noise level could be 3 to 5 dB higher.

# Max. Tilting Moment $M_{2K}$



$$M_{2K} = \frac{F_{2a} * Y + F_{2r} * (X+Z2)}{1000}$$

$M_{2K}$  : [Nm]

$F_{2a}, F_{2r}$  : [N]

$X, Y, Z2$  : [mm]

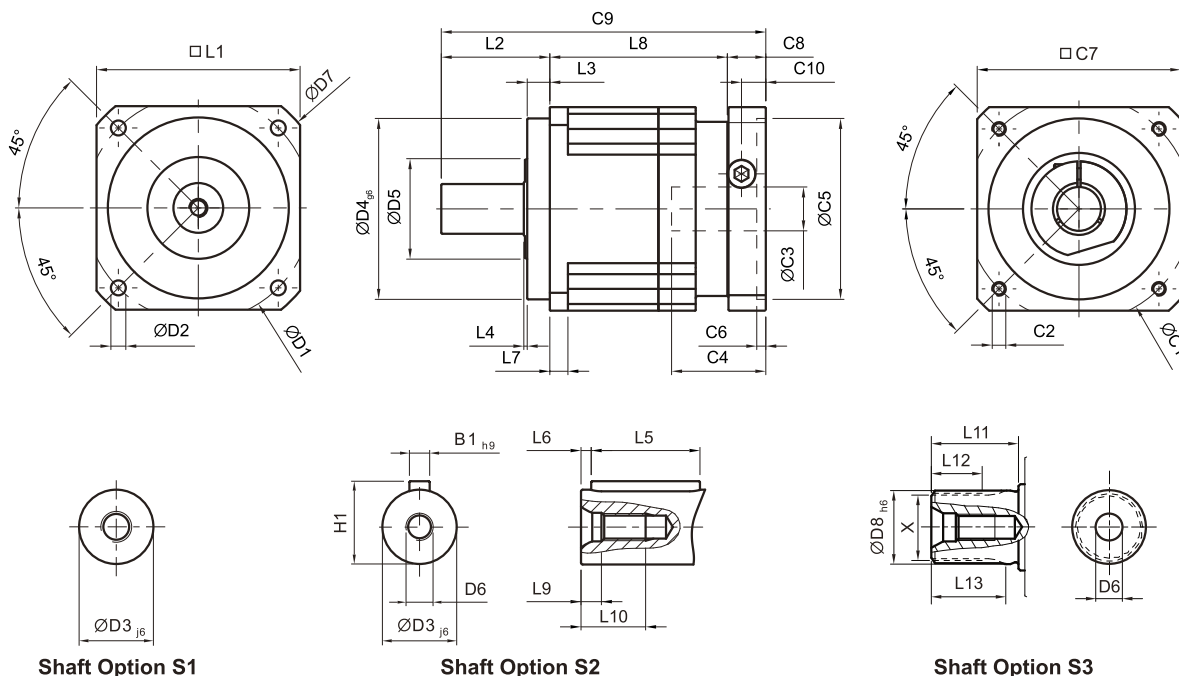
| AB / ABR | 042 | 060 | 090  | 115  | 142  | 180   | 220   |
|----------|-----|-----|------|------|------|-------|-------|
| Z2 [mm]  | 31  | 42  | 56.5 | 71.5 | 85.5 | 102.5 | 127.1 |

Note : Applied to the output shaft center at 100 rpm.

## Gearbox Inertia

| Model No.                     | Stage | Ratio <sup>A</sup> | AB042 | AB060 | AB060A | AB090 | AB090A | AB115 | AB115A | AB142 | AB142A | AB180 | AB220 |       |
|-------------------------------|-------|--------------------|-------|-------|--------|-------|--------|-------|--------|-------|--------|-------|-------|-------|
| Mass Moments of Inertia $J_1$ | 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 |       |
|                               |       | 12                 | 0.03  | 0.03  | 0.16   | 0.16  | 0.61   | 0.61  | 3.25   | 3.25  | 9.21   | 9.21  | 28.98 | 69.61 |
|                               |       | 15                 | 0.03  | 0.03  | 0.13   | 0.13  | 0.47   | 0.47  | 2.71   | 2.71  | 7.42   | 7.42  | 23.29 | 53.27 |
|                               | 2     | 16                 | 0.03  | 0.03  | 0.14   | 0.14  | 0.48   | 0.48  | 2.74   | 2.74  | 7.54   | 7.54  | 23.67 | 54.37 |
|                               |       | 20                 | 0.03  | 0.03  | 0.13   | 0.13  | 0.47   | 0.47  | 2.71   | 2.71  | 7.42   | 7.42  | 23.29 | 53.27 |
|                               |       | 25                 | 0.03  | 0.03  | 0.13   | 0.13  | 0.47   | 0.47  | 2.71   | 2.71  | 7.42   | 7.42  | 23.29 | 53.27 |
|                               |       | 28                 | 0.03  | 0.03  | 0.14   | 0.14  | 0.48   | 0.48  | 2.74   | 2.74  | 7.54   | 7.54  | 23.67 | 54.37 |
|                               |       | 30                 | 0.03  | 0.03  | 0.13   | 0.13  | 0.47   | 0.47  | 2.71   | 2.71  | 7.42   | 7.42  | 23.29 | 53.27 |
|                               |       | 32                 | 0.03  | 0.03  | 0.14   | 0.14  | 0.48   | 0.48  | 2.74   | 2.74  | 7.54   | 7.54  | 23.67 | 54.37 |
|                               |       | 35                 | 0.03  | 0.03  | 0.13   | 0.13  | 0.47   | 0.47  | 2.71   | 2.71  | 7.42   | 7.42  | 23.29 | 53.27 |
|                               |       | 40                 | 0.03  | 0.03  | 0.13   | 0.13  | 0.47   | 0.47  | 2.71   | 2.71  | 7.42   | 7.42  | 23.29 | 53.27 |
|                               |       | 45                 | 0.03  | 0.03  | 0.13   | 0.13  | 0.47   | 0.47  | 2.71   | 2.71  | 7.42   | 7.42  | 23.29 | 53.27 |
|                               |       | 50                 | 0.03  | 0.03  | 0.13   | 0.13  | 0.44   | 0.44  | 2.57   | 2.57  | 7.03   | 7.03  | 22.51 | 50.56 |
| 60                            | 0.03  | 0.03               | 0.13  | 0.13  | 0.44   | 0.44  | 2.57   | 2.57  | 7.03   | 7.03  | 22.51  | 50.56 |       |       |
| 70                            | 0.03  | 0.03               | 0.13  | 0.13  | 0.44   | 0.44  | 2.57   | 2.57  | 7.03   | 7.03  | 22.51  | 50.56 |       |       |
| 80                            | 0.03  | 0.03               | 0.13  | 0.13  | 0.44   | 0.44  | 2.57   | 2.57  | 7.03   | 7.03  | 22.51  | 50.56 |       |       |
| 90                            | 0.03  | 0.03               | 0.13  | 0.13  | 0.44   | 0.44  | 2.57   | 2.57  | 7.03   | 7.03  | 22.51  | 50.56 |       |       |
| 100                           | 0.03  | 0.03               | 0.13  | 0.13  | 0.44   | 0.44  | 2.57   | 2.57  | 7.03   | 7.03  | 22.51  | 50.56 |       |       |

# Dimensions (1-stage, Ratio $i=3\sim 10$ ) / AB Series



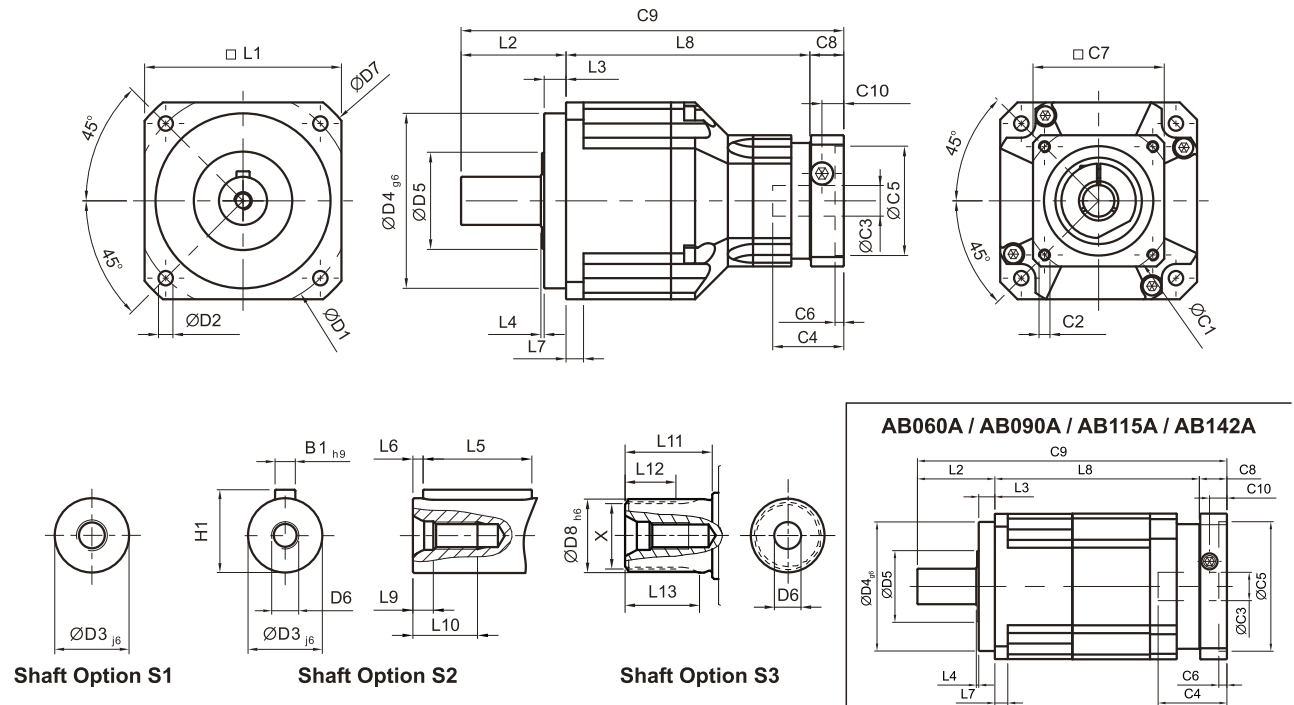
[unit: mm]

| 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 $j_6$         | 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                |
| D8 $h_6$         | -                     | 16                    | 22                    | 32                    | 40                 | 55                 | 75                 |
| 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                 |
| L11              | -                     | 26                    | 26                    | 26                    | 40                 | 41.5               | 52                 |
| L12              | -                     | 15                    | 15                    | 15                    | 20                 | 21.5               | 28                 |
| L13              | -                     | 21                    | 22.5                  | 23                    | 33.5               | 33.5               | 45                 |
| C1 <sup>1</sup>  | 46                    | 70                    | 100                   | 130                   | 165                | 215                | 235                |
| C2 <sup>1</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>1</sup>  | $\leq 11 / \leq 12^2$ | $\leq 14 / \leq 16^2$ | $\leq 19 / \leq 24^2$ | $\leq 32$             | $\leq 38$          | $\leq 48$          | $\leq 55$          |
| C4 <sup>1</sup>  | 25                    | 34                    | 40                    | 50                    | 60                 | 85                 | 116                |
| C5 <sup>1</sup>  | 30                    | 50                    | 80                    | 110                   | 130                | 180                | 200                |
| C6 <sup>1</sup>  | 3.5                   | 8                     | 4                     | 5                     | 6                  | 6                  | 6                  |
| C7 <sup>1</sup>  | 42                    | 60                    | 90                    | 115                   | 142                | 190                | 220                |
| C8 <sup>1</sup>  | 29.5                  | 19                    | 17                    | 19.5                  | 22.5               | 29                 | 63                 |
| C9 <sup>1</sup>  | 86.5                  | 117                   | 143.5                 | 186.5                 | 239                | 288                | 364.5              |
| C10 <sup>1</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               |
| X<br>DIN5480     | -                     | W16x0.8x<br>30x18x6m  | W22x1.25x<br>30x16x6m | W32x1.25x<br>30x24x6m | W40x2x<br>30x18x6m | W55x2x<br>30x26x6m | W70x2x<br>30x34x6m |

1. C1~C10 are motor specific dimensions (metric std shown). Refer to [www.apexdyna.com](http://www.apexdyna.com) and Design Tool to view your specific motor mounting system.  
 2. AB042M1 ratio 5, 10 offers C3  $\leq 12$  option; AB060M1 ratio 5, 10 offers C3  $\leq 16$  option; AB090M1 offers C3  $\leq 24$  option.



# Dimensions (2-stage, Ratio i=12~100) / AB Series



[unit: mm]

| Dimension        | AB042                  | AB060                  | AB060A                 | AB090                            | AB090A                 | AB115                  | AB115A     | AB142              | AB142A             | 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                |             |
| D8 <sub>h6</sub> | -                      | 16                     |                        | 22                               |                        | 32                     |            | 40                 | 55                 | 75                 |             |
| 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                  | 163        | 176                | 191                | 209.5              | 248         |
| L9               | 4.5                    | 4.8                    |                        | 7.2                              |                        | 10                     |            | 12                 | 15                 | 15                 |             |
| L10              | 10                     | 12.5                   |                        | 19                               |                        | 28                     |            | 36                 | 42                 | 42                 |             |
| L11              | -                      | 26                     |                        | 26                               |                        | 26                     |            | 40                 | 41.5               | 52                 |             |
| L12              | -                      | 15                     |                        | 15                               |                        | 15                     |            | 20                 | 21.5               | 28                 |             |
| L13              | -                      | 21                     |                        | 22.5                             |                        | 23                     |            | 33.5               | 33.5               | 45                 |             |
| C1 <sup>3</sup>  | 46                     | 46                     | 70                     | 70                               | 100                    | 100                    | 130        | 130                | 165                | 165                | 215         |
| C2 <sup>3</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 | M8 x 1.25P         | M10 x 1.5P         | M10 x 1.5P         | M12 x 1.75P |
| C3 <sup>3</sup>  | ≤11 / ≤12 <sup>4</sup> | ≤11 / ≤12 <sup>4</sup> | ≤14 / ≤16 <sup>4</sup> | ≤14 / ≤15.875 / ≤16 <sup>4</sup> | ≤19 / ≤24 <sup>4</sup> | ≤19 / ≤24 <sup>4</sup> | ≤32        | ≤32                | ≤38                | ≤38                | ≤48         |
| C4 <sup>3</sup>  | 25                     | 25                     | 34                     | 34                               | 40                     | 40                     | 50         | 50                 | 60                 | 60                 | 85          |
| C5 <sup>3</sup>  | 30                     | 30                     | 50                     | 50                               | 80                     | 80                     | 110        | 110                | 130                | 130                | 180         |
| C6 <sup>3</sup>  | 3.5                    | 3.5                    | 8                      | 8                                | 4                      | 4                      | 5          | 5                  | 6                  | 6                  | 6           |
| C7 <sup>3</sup>  | 42                     | 42                     | 60                     | 60                               | 90                     | 90                     | 115        | 115                | 142                | 142                | 190         |
| C8 <sup>3</sup>  | 29.5                   | 29.5                   | 19                     | 19                               | 17                     | 17                     | 19.5       | 19.5               | 22.5               | 22.5               | 29          |
| C9 <sup>3</sup>  | 114                    | 138.5                  | 154                    | 178.5                            | 191.5                  | 225.5                  | 247.5      | 292.5              | 310.5              | 337                | 415         |
| C10 <sup>3</sup> | 8.75                   | 8.75                   | 13.5                   | 13.5                             | 10.75                  | 10.75                  | 13         | 13                 | 15                 | 15                 | 20.75       |
| B1 <sub>h9</sub> | 5                      | 5                      |                        | 6                                |                        | 10                     |            | 12                 | 16                 | 20                 |             |
| H1               | 15                     | 18                     |                        | 24.5                             |                        | 35                     |            | 43                 | 59                 | 79.5               |             |
| X<br>DIN5480     | -                      | W16x0.8x<br>30x18x6m   |                        | W22x1.25x<br>30x16x6m            |                        | W32x1.25x<br>30x24x6m  |            | W40x2x<br>30x18x6m | W55x2x<br>30x26x6m | W70x2x<br>30x34x6m |             |

3. C1~C10 are motor specific dimensions (metric std shown). Refer to [www.apexdyna.com](http://www.apexdyna.com) and Design Tool to view your specific motor mounting system.  
 4. AB042M1 offers C3 ≤ 12 option; AB060/A M1 offers C3 ≤ 12/16 option; AB090/A M1 offers C3 ≤ 16/24 option; AB090 M2 offers C3 ≤ 15.875.  
 AB115M1 offers C3 ≤ 24 option.

# Specifications / ABR Series

## Gearbox Performance

| Model No.                              |           | Stage | Ratio <sup>(1)</sup> | ABR042                           | ABR060 | ABR060A | ABR090 | ABR090A | ABR115 | ABR115A | ABR142 | ABR142A | ABR180 | ABR220 |   |
|--|-----------|-------|----------------------|----------------------------------|--------|---------|--------|---------|--------|---------|--------|---------|--------|--------|---|
| Nominal Output Torque $T_{2N}$         | 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                               | 60     | -       | 150    | -       | 325    | -       | 650    | -       | 1,200  | 2,000  |   |
|  |           |       | 12                   | -                                | 55     | -       | 150    | -       | 310    | -       | 600    | -       | 1,100  | 1,900  |   |
|  |           |       | 14                   | -                                | 42     | -       | 140    | -       | 300    | -       | 550    | -       | 1,100  | 1,800  |   |
|  |           | 16    | -                    | 45                               | -      | 120     | -      | 260     | -      | 500     | -      | 1,000   | 1,600  |        |   |
|  |           | 20    | -                    | 40                               | -      | 100     | -      | 230     | -      | 450     | -      | 900     | 1,500  |        |   |
|  |           | 12    | 12                   | -                                | -      | -       | -      | -       | -      | -       | -      | -       | -      | -      | - |
|  |           | 15    | 14                   | -                                | -      | -       | -      | -       | -      | -       | -      | -       | -      | -      | - |
|  |           | 16    | 15                   | -                                | -      | -       | -      | -       | -      | -       | -      | -       | -      | -      | - |
|  |           | 20    | 14                   | -                                | -      | -       | -      | -       | -      | -       | -      | -       | -      | -      | - |
|  |           | 25    | 15                   | 60                               | 60     | 150     | 150    | 325     | 325    | 650     | 650    | 1,200   | 2,000  |        |   |
|  |           | 28    | 19                   | 50                               | 50     | 140     | 140    | 300     | 300    | 550     | 550    | 1,100   | 1,800  |        |   |
|  |           | 30    | 20                   | 55                               | 55     | 150     | 150    | 310     | 310    | 600     | 600    | 1,100   | 1,900  |        |   |
|  |           | 32    | 17                   | 45                               | 45     | 120     | 120    | 260     | 260    | 500     | 500    | 1,000   | 1,600  |        |   |
|  |           | 35    | 19                   | 50                               | 50     | 140     | 140    | 300     | 300    | 550     | 550    | 1,100   | 1,800  |        |   |
|  |           | 40    | 17                   | 45                               | 45     | 120     | 120    | 260     | 260    | 500     | 500    | 1,000   | 1,600  |        |   |
|  |           | 45    | 14                   | 40                               | 40     | 100     | 100    | 230     | 230    | 450     | 450    | 900     | 1,500  |        |   |
|  |           | 48    | -                    | -                                | 55     | 150     | 150    | 310     | 310    | 600     | 600    | 1,100   | 1,900  |        |   |
|  |           | 50    | 14                   | 60                               | 60     | 150     | 150    | 325     | 325    | 650     | 650    | 1,200   | 2,000  |        |   |
|  |           | 60    | 20                   | 55                               | 55     | 150     | 150    | 310     | 310    | 600     | 600    | 1,100   | 1,900  |        |   |
|  |           | 64    | -                    | -                                | 45     | 120     | 120    | 260     | 260    | 500     | 500    | 1,000   | 1,600  |        |   |
|  |           | 70    | 19                   | 50                               | 50     | 140     | 140    | 300     | 300    | 550     | 550    | 1,100   | 1,800  |        |   |
|  |           | 80    | 17                   | 45                               | 45     | 120     | 120    | 260     | 260    | 500     | 500    | 1,000   | 1,600  |        |   |
|  |           | 90    | 14                   | 40                               | 40     | 100     | 100    | 230     | 230    | 450     | 450    | 900     | 1,500  |        |   |
| 100                                    | 14        | 40    | 60                   | 150                              | 150    | 325     | 325    | 650     | 650    | 1,200   | 2,000  |         |        |        |   |
| 120                                    | -         | -     | 55                   | 150                              | 150    | 310     | 310    | 600     | 600    | 1,100   | 1,900  |         |        |        |   |
| 140                                    | -         | -     | 50                   | 140                              | 140    | 300     | 300    | 550     | 550    | 1,100   | 1,800  |         |        |        |   |
| 160                                    | -         | -     | 45                   | 120                              | 120    | 260     | 260    | 500     | 500    | 1,000   | 1,600  |         |        |        |   |
| 180                                    | -         | -     | 40                   | 100                              | 100    | 230     | 230    | 450     | 450    | 900     | 1,500  |         |        |        |   |
| 200                                    | -         | -     | 40                   | 100                              | 100    | 230     | 230    | 450     | 450    | 900     | 1,500  |         |        |        |   |
| Emergency Stop Torque $T_{2NOT}^{(2)}$ | Nm        | 1,2   | 3~200                | 3 times of Nominal Output Torque |        |         |        |         |        |         |        |         |        |        |   |
| Nominal Input Speed $n_{1N}$           | rpm       | 1,2   | 3~200                | 5,000                            | 5,000  | 5,000   | 4,000  | 4,000   | 4,000  | 4,000   | 3,000  | 3,000   | 3,000  | 2,000  |   |
| Max. Input Speed $n_{1B}$              | rpm       | 1,2   | 3~200                | 10,000                           | 10,000 | 10,000  | 8,000  | 8,000   | 8,000  | 8,000   | 6,000  | 6,000   | 6,000  | 4,000  |   |
| Micro Backlash P0                      | arcmin    | 1     | 3~20                 | -                                | -      | -       | ≤2     | -       | ≤2     | -       | ≤2     | -       | ≤2     | ≤2     |   |
|  |           | 2     | 12~200               | -                                | -      | -       | ≤4     | ≤4      | ≤4     | ≤4      | ≤4     | ≤4      | ≤4     | ≤4     |   |
| Reduced Backlash P1                    | arcmin    | 1     | 3~20                 | ≤4                               | ≤4     | -       | ≤4     | -       | ≤4     | -       | ≤4     | -       | ≤4     | ≤4     |   |
|  |           | 2     | 12~200               | ≤7                               | ≤7     | ≤7      | ≤7     | ≤7      | ≤7     | ≤7      | ≤7     | ≤7      | ≤7     | ≤7     |   |
| Standard Backlash P2                   | arcmin    | 1     | 3~20                 | ≤6                               | ≤6     | -       | ≤6     | -       | ≤6     | -       | ≤6     | -       | ≤6     | ≤6     |   |
|  |           | 2     | 12~200               | ≤9                               | ≤9     | ≤9      | ≤9     | ≤9      | ≤9     | ≤9      | ≤9     | ≤9      | ≤9     | ≤9     |   |
| Torsional Rigidity                     | Nm/arcmin | 1,2   | 3~200                | 3                                | 7      | 7       | 14     | 14      | 25     | 25      | 50     | 50      | 145    | 225    |   |
| Max. Radial Load $F_{2RB}^{(3)}$       | N         | 1,2   | 3~200                | 780                              | 1,530  | 1,530   | 3,250  | 3,250   | 6,700  | 6,700   | 9,400  | 9,400   | 14,500 | 50,000 |   |
| Max. Axial Load $F_{2AB}^{(3)}$        | N         | 1,2   | 3~200                | 390                              | 765    | 765     | 1,625  | 1,625   | 3,350  | 3,350   | 4,700  | 4,700   | 7,250  | 25,000 |   |
| Max. Tilting Moment $M_{2K}$           | Nm        | 1,2   | 3~200                | 25                               | 70     | 70      | 200    | 200     | 550    | 550     | 990    | 990     | 1,760  | 7,630  |   |
| Efficiency $\eta$                      | %         | 1     | 3~20                 | ≥95%                             |        |         |        |         |        |         |        |         |        |        |   |
|  |           | 2     | 12~200               | ≥92%                             |        |         |        |         |        |         |        |         |        |        |   |
| Weight                                 | kg        | 1     | 3~20                 | 0.9                              | 2.1    | -       | 6.4    | -       | 12.1   | -       | 23     | -       | 44.5   | 77     |   |
|  |           | 2     | 12~200               | 1.2                              | 1.8    | 2.7     | 4.8    | 7.9     | 11.5   | 15.9    | 21.5   | 29.6    | 41.5   | 75     |   |
| Operating Temp                         | °C        | 1,2   | 3~200                | -10°C~+90°C                      |        |         |        |         |        |         |        |         |        |        |   |
| Lubrication                            |           | 1,2   | 3~200                | Synthetic lubrication oils       |        |         |        |         |        |         |        |         |        |        |   |
| Degree of Gearbox Protection           |           | 1,2   | 3~200                | IP65                             |        |         |        |         |        |         |        |         |        |        |   |
| Mounting Position                      |           | 1,2   | 3~200                | all directions                   |        |         |        |         |        |         |        |         |        |        |   |
| Noise <sup>(4)</sup>                   | dB(A)     | 1,2   | 3~200                | ≤61                              | ≤63    | ≤65     | ≤65    | ≤68     | ≤68    | ≤70     | ≤70    | ≤72     | ≤72    | ≤74    |   |

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

(2) Max. acceleration torque  $T_{2B} = 60\%$  of  $T_{2NOT}$

(3) Applied to the output shaft center at 100 rpm

(4) The dB values are measured by gearbox with ratio 10 (1-stage) or ratio 100 (2-stage), no loading at 3,000 RPM or at the respective Nominal Input Speed by bigger model size.

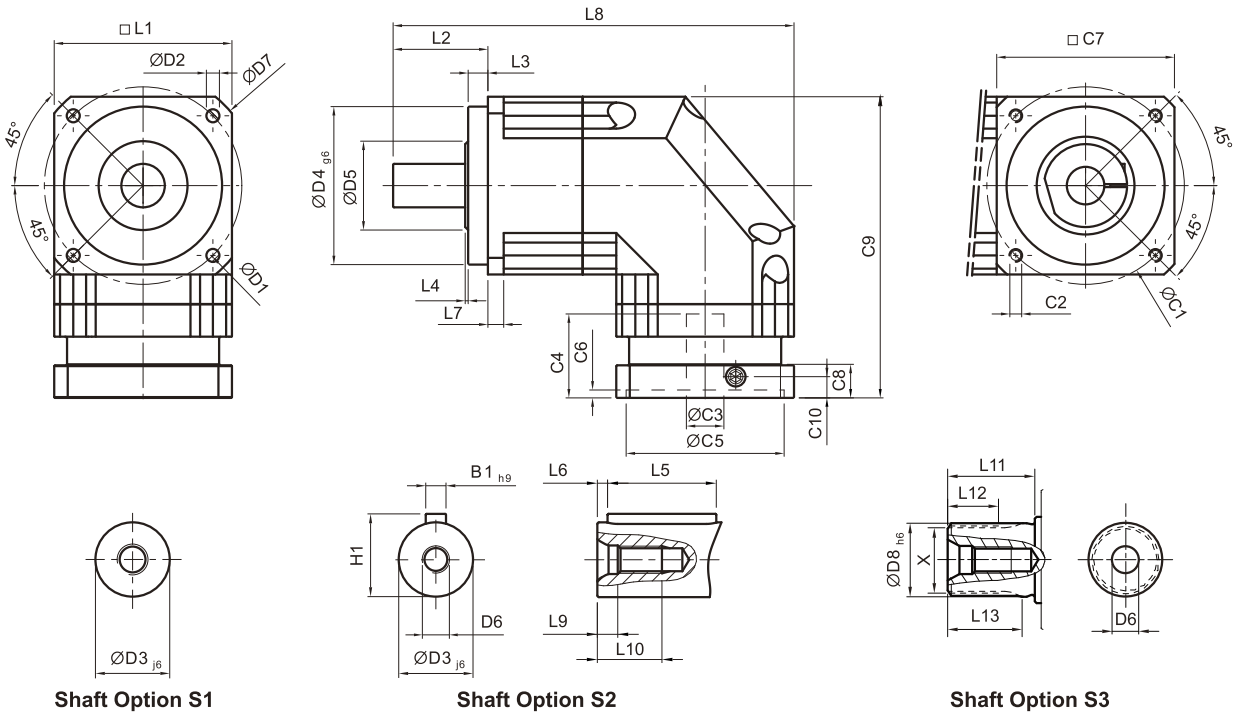
By lower ratio and/or higher RPM, the noise level could be 3 to 5 dB higher.



## Gearbox Inertia

| Model No.                  |                      | Stage | Ratio   | ABR042 | ABR060 | ABR060A | ABR090 | ABR090A | ABR115 | ABR115A | ABR142 | ABR142A | ABR180 | ABR220 |   |
|----------------------------|----------------------|-------|---------|--------|--------|---------|--------|---------|--------|---------|--------|---------|--------|--------|---|
| Mass Moments of Inertia J, | kg · cm <sup>2</sup> | 1     | 3~10    | 0.09   | 0.35   | –       | 2.25   | –       | 6.84   | –       | 23.4   | –       | 68.9   | 135.4  |   |
|                            |                      |       | 12~20   | –      | 0.31   | –       | 1.87   | –       | 6.25   | –       | 21.8   | –       | 65.6   | 119.8  |   |
|                            |                      | 2     | 12~20   | 0.09   | –      | –       | –      | –       | –      | –       | –      | –       | –      | –      | – |
|                            |                      |       | 25~90   | 0.09   | 0.09   | 0.35    | 0.35   | 2.25    | 2.25   | 6.84    | 6.84   | 23.4    | 23.4   | 68.9   | – |
|                            |                      |       | 48, 64  | –      | –      | 0.31    | 0.31   | 1.87    | 1.87   | 6.25    | 6.25   | 21.8    | 21.8   | 65.6   | – |
|                            |                      |       | 100~200 | –      | –      | 0.31    | 0.31   | 1.87    | 1.87   | 6.25    | 6.25   | 21.8    | 21.8   | 65.6   | – |

# Dimensions (1-stage, Ratio $i=3\sim 20$ ) / ABR Series

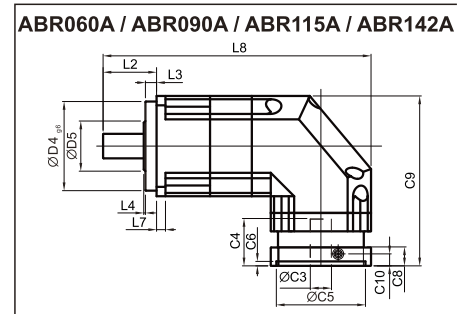
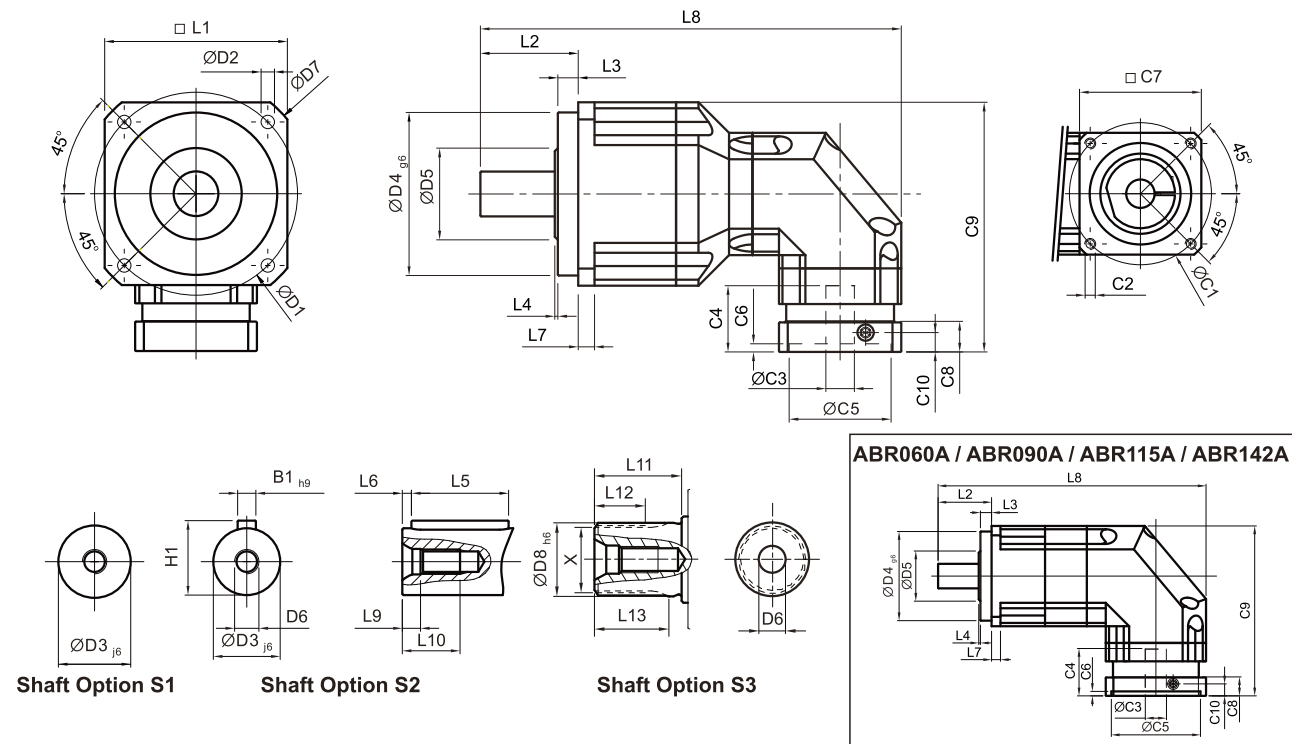


[unit: mm]

| 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 j6            | 13                    | 16                    | 22                    | 32                    | 40                 | 55                 | 75                 |
| D4 g6            | 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                |
| D8 h6            | -                     | 16                    | 22                    | 32                    | 40                 | 55                 | 75                 |
| 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                 |
| L11              | -                     | 26                    | 26                    | 26                    | 40                 | 41.5               | 52                 |
| L12              | -                     | 15                    | 15                    | 15                    | 20                 | 21.5               | 28                 |
| L13              | -                     | 21                    | 22.5                  | 23                    | 33.5               | 33.5               | 45                 |
| C1 <sup>1</sup>  | 46                    | 70                    | 100                   | 130                   | 165                | 215                | 235                |
| C2 <sup>1</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>1</sup>  | $\leq 11 / \leq 12^2$ | $\leq 14 / \leq 16^2$ | $\leq 19 / \leq 24^2$ | $\leq 32$             | $\leq 38$          | $\leq 48$          | $\leq 55$          |
| C4 <sup>1</sup>  | 25                    | 34                    | 40                    | 50                    | 60                 | 85                 | 116                |
| C5 <sup>1</sup>  | 30                    | 50                    | 80                    | 110                   | 130                | 180                | 200                |
| C6 <sup>1</sup>  | 3.5                   | 8                     | 4                     | 5                     | 6                  | 6                  | 6                  |
| C7 <sup>1</sup>  | 42                    | 60                    | 90                    | 115                   | 142                | 190                | 220                |
| C8 <sup>1</sup>  | 29.5                  | 19                    | 17                    | 19.5                  | 22.5               | 29                 | 63                 |
| C9 <sup>1</sup>  | 90.5                  | 111.5                 | 152.5                 | 191.5                 | 235.5              | 303.5              | 378.5              |
| C10 <sup>1</sup> | 8.75                  | 13.5                  | 10.75                 | 13                    | 15                 | 20.75              | 53                 |
| B1 h9            | 5                     | 5                     | 6                     | 10                    | 12                 | 16                 | 20                 |
| H1               | 15                    | 18                    | 24.5                  | 35                    | 43                 | 59                 | 79.5               |
| X<br>DIN5480     | -                     | W16x0.8x<br>30x18x6m  | W22x1.25x<br>30x16x6m | W32x1.25x<br>30x24x6m | W40x2x<br>30x18x6m | W55x2x<br>30x26x6m | W70x2x<br>30x34x6m |

1. C1~C10 are motor specific dimensions (metric std shown). Refer to [www.apexdyna.com](http://www.apexdyna.com) and Design Tool to view your specific motor mounting system.  
 2. ABR042M1 offers C3  $\leq 12$  option; ABR060M1 offers C3  $\leq 16$  option; ABR090M1 offers C3  $\leq 24$  option.

# Dimensions (2-stage, Ratio i=12~200) / ABR Series

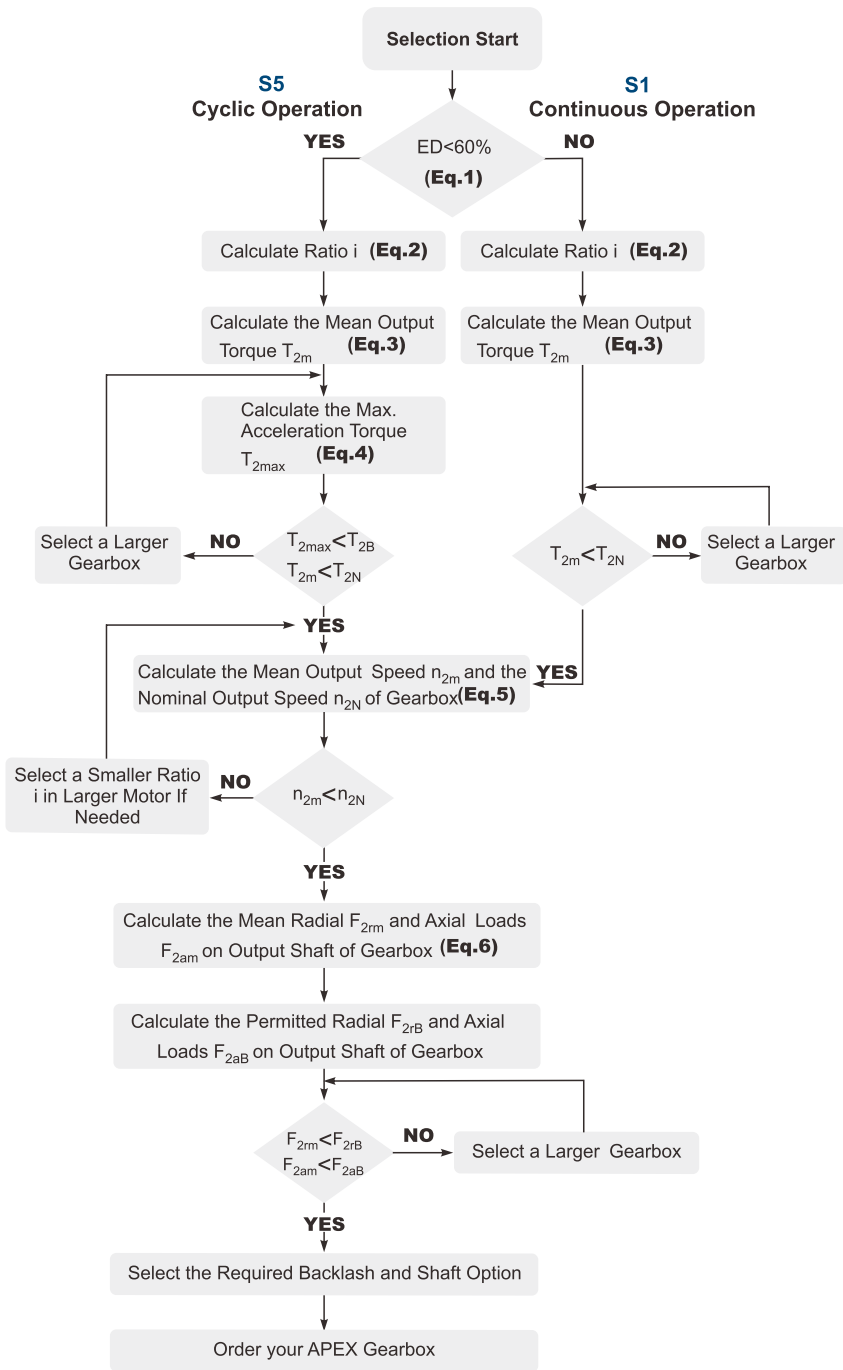


[unit: mm]

| Dimension        | ABR042                 | ABR060                 | ABR060A                | ABR090                           | ABR090A                | ABR115                 | ABR115A  | ABR142             | ABR142A  | ABR180             | ABR220             |
|------------------|------------------------|------------------------|------------------------|----------------------------------|------------------------|------------------------|----------|--------------------|----------|--------------------|--------------------|
| 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                       |                        | M12x1.75P              |          | M16x2P             |          | M20x2.5P           | M20x2.5P           |
| D7               | 56                     | 80                     |                        | 116                              |                        | 152                    |          | 185                |          | 240                | 292                |
| D8 <sub>h6</sub> | -                      | 16                     |                        | 22                               |                        | 32                     |          | 40                 |          | 55                 | 75                 |
| 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                  | 182                    | 206.5                            | 251                    | 285                    | 320      | 365                | 404.5    | 431                | 521                |
| L9               | 4.5                    | 4.8                    |                        | 7.2                              |                        | 10                     |          | 12                 |          | 15                 | 15                 |
| L10              | 10                     | 12.5                   |                        | 19                               |                        | 28                     |          | 36                 |          | 42                 | 42                 |
| L11              | -                      | 26                     |                        | 26                               |                        | 26                     |          | 40                 |          | 41.5               | 52                 |
| L12              | -                      | 15                     |                        | 15                               |                        | 15                     |          | 20                 |          | 21.5               | 28                 |
| L13              | -                      | 21                     |                        | 22.5                             |                        | 23                     |          | 33.5               |          | 33.5               | 45                 |
| C1 <sup>3</sup>  | 46                     | 46                     | 70                     | 70                               | 100                    | 100                    | 130      | 130                | 165      | 165                | 215                |
| C2 <sup>3</sup>  | M4 x 0.7P              | M4 x 0.7P              | M5 x 0.8P              | M5x0.8P                          | M6x1P                  | M6x1P                  | M8x1.25P | M8x1.25P           | M10x1.5P | M10x1.5P           | M12x1.75P          |
| C3 <sup>3</sup>  | ≤11 / ≤12 <sup>4</sup> | ≤11 / ≤12 <sup>4</sup> | ≤14 / ≤16 <sup>4</sup> | ≤14 / ≤15.875 / ≤16 <sup>4</sup> | ≤19 / ≤24 <sup>4</sup> | ≤19 / ≤24 <sup>4</sup> | ≤32      | ≤32                | ≤38      | ≤38                | ≤48                |
| C4 <sup>3</sup>  | 25                     | 25                     | 34                     | 34                               | 40                     | 40                     | 50       | 50                 | 60       | 60                 | 85                 |
| C5 <sup>3</sup>  | 30                     | 30                     | 50                     | 50                               | 80                     | 80                     | 110      | 110                | 130      | 130                | 180                |
| C6 <sup>3</sup>  | 3.5                    | 3.5                    | 8                      | 8                                | 4                      | 4                      | 5        | 5                  | 6        | 6                  | 6                  |
| C7 <sup>3</sup>  | 42                     | 42                     | 60                     | 60                               | 90                     | 90                     | 115      | 115                | 142      | 142                | 190                |
| C8 <sup>3</sup>  | 29.5                   | 29.5                   | 19                     | 19                               | 17                     | 17                     | 19.5     | 19.5               | 22.5     | 22.5               | 29                 |
| C9 <sup>3</sup>  | 90.5                   | 99.5                   | 111.5                  | 126.5                            | 152.5                  | 165                    | 191.5    | 205                | 235.5    | 254.5              | 323.5              |
| C10 <sup>3</sup> | 8.75                   | 8.75                   | 13.5                   | 13.5                             | 10.75                  | 10.75                  | 13       | 13                 | 15       | 15                 | 20.75              |
| B1 <sub>h9</sub> | 5                      | 5                      |                        | 6                                |                        | 10                     |          | 12                 |          | 16                 | 20                 |
| H1               | 15                     | 18                     |                        | 24.5                             |                        | 35                     |          | 43                 |          | 59                 | 79.5               |
| X<br>DIN5480     | -                      | W16x0.8x<br>30x18x6m   |                        | W22x1.25x<br>30x16x6m            |                        | W32x1.25x<br>30x24x6m  |          | W40x2x<br>30x18x6m |          | W55x2x<br>30x26x6m | W70x2x<br>30x34x6m |

3. C1~C10 are motor specific dimensions (metric std shown). Refer to [www.apexdyna.com](http://www.apexdyna.com) and Design Tool to view your specific motor mounting system.  
 4. ABR042M1 offers C3 ≤ 12 option; ABR060/A M1 offers C3 ≤ 12/16 option; ABR090/A M1 offers C3 ≤ 16/24 option; ABR090 M2 offers C3 ≤ 15.875. ABR115M1 offers C3 ≤ 24 option.

# Selection of the Optimum Gearbox



**Recommended (for S5 Cycle Operation)**

The general design is given for

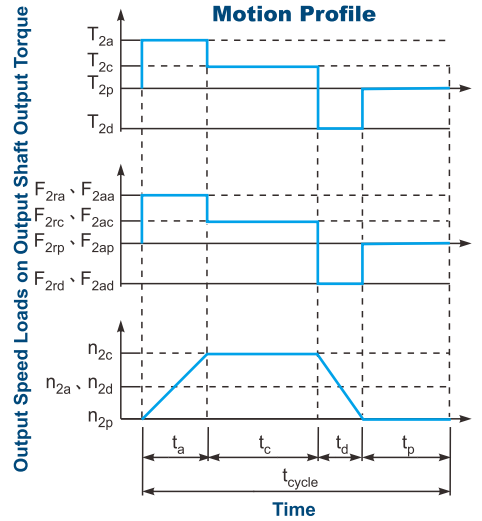
$$\frac{J_L}{i^2} \leq 4 \times J_m$$

The optimal design is given for

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

$J_L$  Load Inertia

$J_m$  Motor Inertia



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

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)**

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

**(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)**

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

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

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

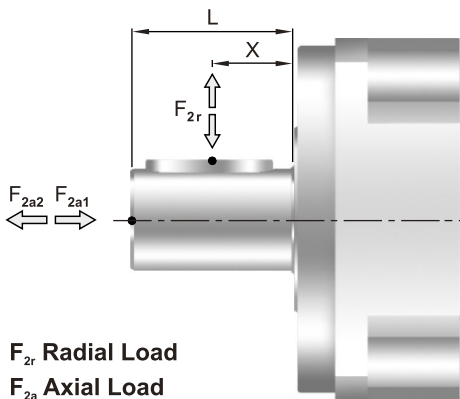
**(Eq.5)**

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

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

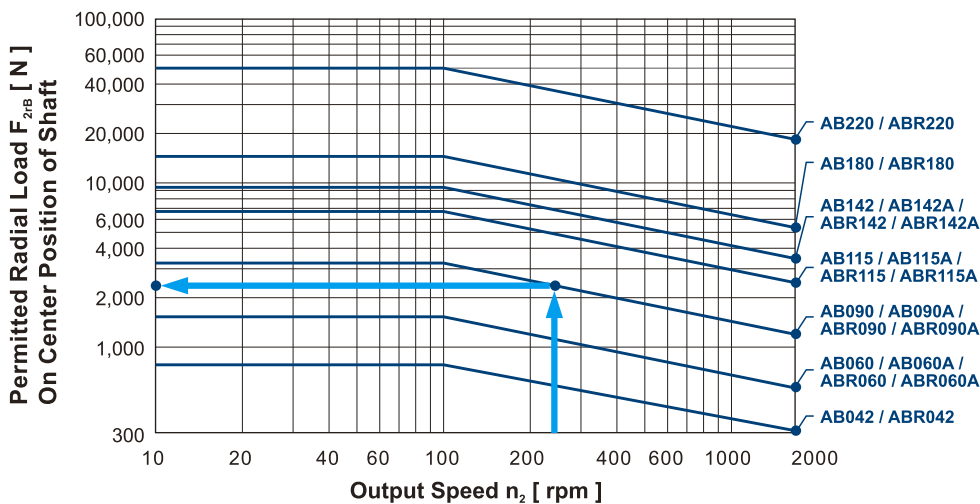
**(Eq.6)**

# Permitted Radial and Axial Loads

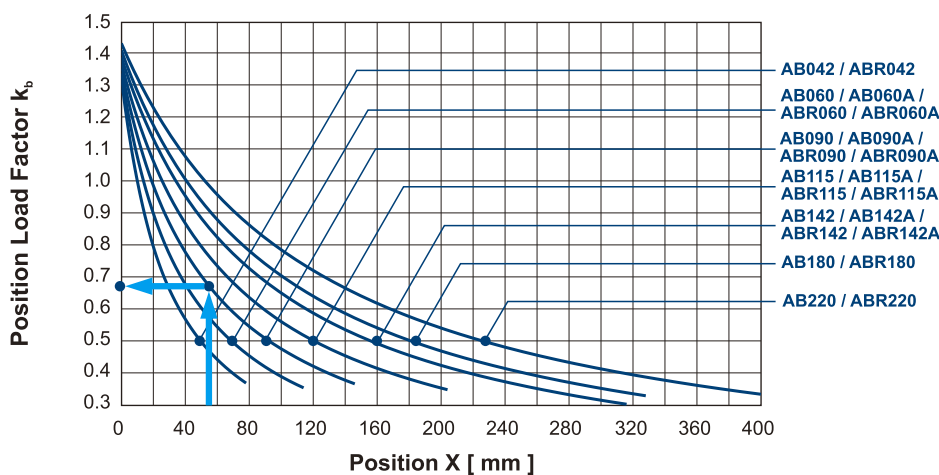


The permitted radial and axial loads on output shaft of the gearbox depend on the design of the gearbox supporting bearings. APEX use the extension straddle oversized ball bearing design. It can take heavy load from both axes.

$F_{2r}$  Radial Load  
 $F_{2a}$  Axial Load



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



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