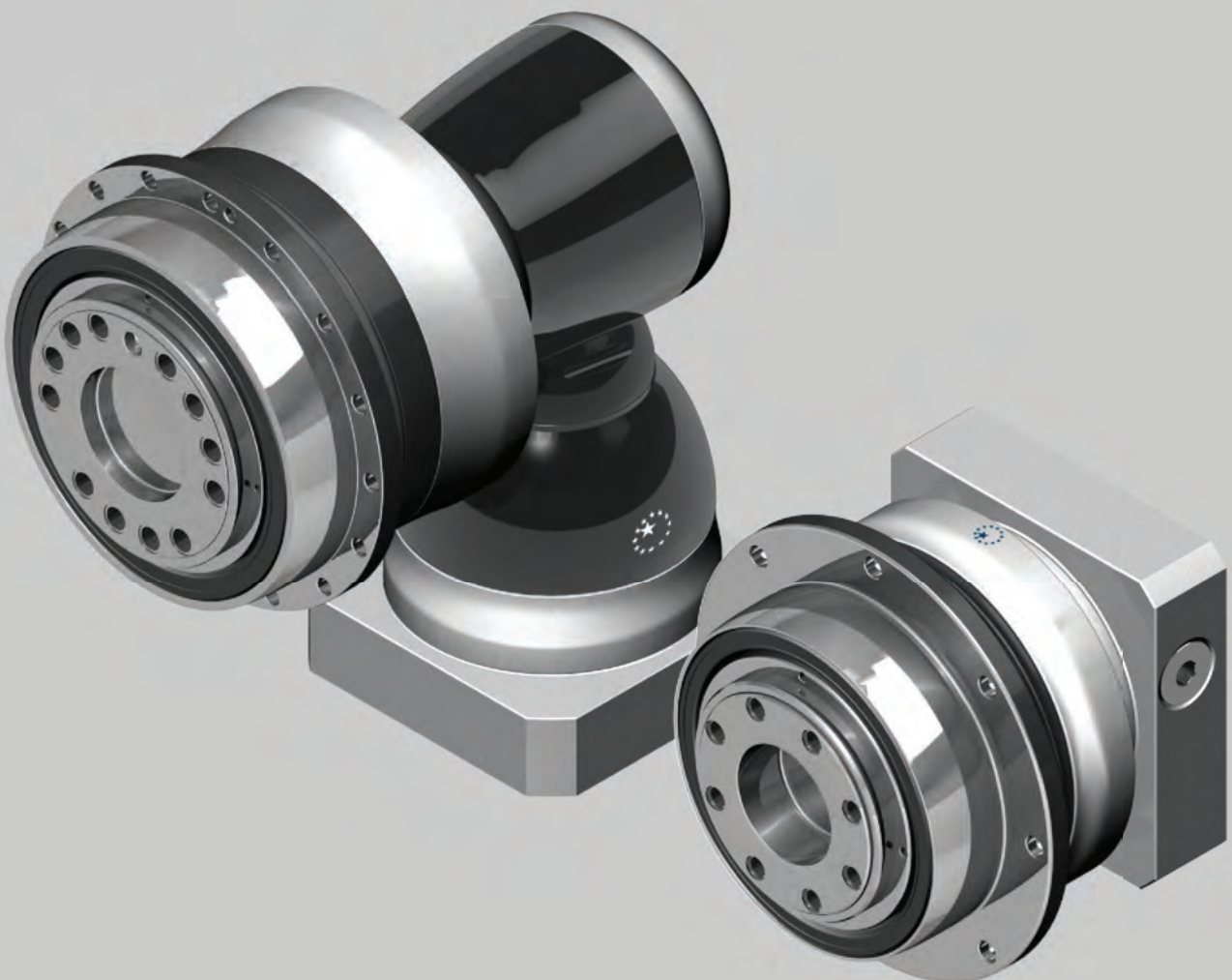




**APEX DYNAMICS, INC.**

**NEW GENERATION  
PLANETARY GEARBOX  
AH / AHK - SERIES**



## Gearbox Series - AH / AHK

### ► Features:

High Torque

High efficiency

Long-Term persistence of reduced backlash

Low noise

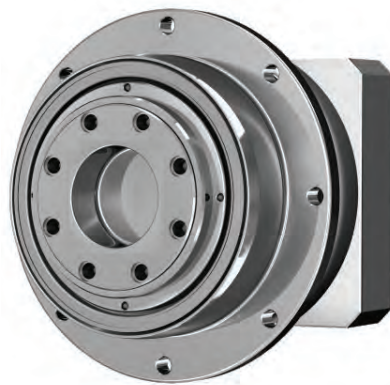
Long service life

Limited temperature rise

Optimized output torque

Optimized Inertia moment

Flexible mounting diameters



# Ordering Code - AH / AHK Gearbox

|                              |   |                          |   |                     |
|------------------------------|---|--------------------------|---|---------------------|
| <b>AH090</b>                 | — | <b>005<sup>(1)</sup></b> | / | <b>MOTOR</b>        |
| <b>AHK090</b>                | — | <b>005<sup>(1)</sup></b> | / | <b>MOTOR</b>        |
| <b>AHKA285<sup>(3)</sup></b> |   |                          |   | <b>Motor Type</b>   |
| <b>AHKB090<sup>(3)</sup></b> |   |                          |   | <b>Ratio</b>        |
|                              |   |                          |   | <b>Gearbox Size</b> |

## Gearbox Size

**AH 064 / 090 / 110 / 140 / 200 / 255 / 285 / 355 / 450**

**AHK 064 / 090 / 110 / 140 / 200 / 255 / 285 / 355 / 450**

## Ratio<sup>(2)</sup>

**AH 4 / 5 / 7 / 10**

**16 / 20 / 21 / 25 / 28 / 31 / 35 / 40 / 46 / 50 / 61 / 70 / 91 / 100**

**AHK (2 Stg.) 12 / 15 / 16 / 20 / 25 / 28 / 35 / 40 / 49 / 50 / 70 / 100**

**AHKA (3 Stg.) 100 / 125 / 140 / 175 / 200 / 250 / 350 / 500 / 700 / 1,000**

**AHKB (3 Stg.) 64 / 84 / 100 / 125 / 140 / 175 / 200 / 250 / 280 / 350 / 400 / 500 / 700 / 1,000**

**AHK (4 Stg.) 1,225 / 1,400 / 1,750 / 2,000 / 2,800 / 3,500 / 5,000 / 7,000 / 10,000**

**AHKC 4 / 5 / 7 / 8 / 10 / 21 / 31 / 46 / 61 / 91**

## Motor Type

### Manufacturer and Model

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

(2) Please refer to the specifications for the ratios provided in each series.

(3) Please refer to page 06.



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# Performance - AH Gearbox

| Model No.                                   |           | Stage | Ratio <sup>(1)</sup> | AH064                        | AH090 | AH110 | AH140 | AH200  | AH255  | AH285  | AH355   | AH450   |
|---|-----------|-------|----------------------|------------------------------|-------|-------|-------|--------|--------|--------|---------|---------|
| Nominal Output Torque $T_{2N}$              | Nm        | 1     | 4                    | 95                           | 195   | 350   | 600   | 1,290  | -      | -      | -       | -       |
|   |           |       | 5                    | 80                           | 165   | 305   | 525   | 1,145  | 1,745  | 3,285  | -       | -       |
|   |           |       | 7                    | 60                           | 130   | 250   | 435   | 980    | 1,495  | 2,525  | -       | -       |
|   |           |       | 10                   | 24                           | 55    | 160   | 305   | 700    | 1,070  | 1,810  | -       | -       |
|   |           | 2     | 16                   | 95                           | 195   | 360   | 615   | 1,320  | -      | -      | -       | -       |
|   |           |       | 20                   | 95                           | 200   | 360   | 615   | 1,320  | 1,770  | 3,325  | -       | -       |
|   |           |       | 21                   | 80                           | 165   | 310   | 535   | 1,165  | 1,770  | 3,330  | 5,595   | 10,915  |
|   |           |       | 25                   | 80                           | 165   | 310   | 535   | 1,165  | 1,770  | 3,330  | -       | -       |
|   |           |       | 28                   | 60                           | 200   | 360   | 615   | 1,325  | -      | -      | -       | -       |
|   |           |       | 31                   | 60                           | 130   | 250   | 440   | 990    | 1,510  | 2,550  | 4,810   | 9,565   |
|   |           |       | 35                   | 70                           | 170   | 310   | 535   | 1,165  | 1,775  | 3,335  | -       | -       |
|   |           |       | 40                   | 40                           | 96    | 220   | 615   | 1,215  | -      | -      | -       | -       |
|   |           |       | 46                   | 24                           | 55    | 160   | 295   | 660    | 1,005  | 1,700  | 3,400   | 7,125   |
|   |           |       | 50                   | 50                           | 120   | 275   | 535   | 1,170  | 1,775  | 3,340  | -       | -       |
|   |           |       | 61                   | 60                           | 130   | 250   | 440   | 990    | 1,510  | 2,550  | 4,820   | 9,585   |
|   |           |       | 70                   | 60                           | 130   | 250   | 440   | 990    | 1,510  | 2,550  | -       | -       |
| 91  | 24        | 55    | 160                  | 295                          | 660   | 1,005 | 1,700 | 3,345  | 7,000  |        |         |         |
| 100   | 24        | 55    | 160                  | 295                          | 660   | 1,005 | 1,700 | -      | -      |        |         |         |
| Emergency Stop Torque $T_{2NOT}$            | Nm        | 1,2   | 4~100                | 3 times $T_{2N}$             |       |       |       |        |        |        |         |         |
| Max. Acceleration Torque $T_{2B}$           | Nm        | 1,2   | 4~100                | 1.5 times $T_{2N}$           |       |       |       |        |        |        |         |         |
| No Load Running Torque <sup>(3)</sup>       | Nm        | 1     | 4~10                 | 0.45                         | 0.7   | 1.4   | 3.5   | 7      | 11     | 14     | -       | -       |
|   |           | 2     | 16~100               | 0.2                          | 0.3   | 0.6   | 1.3   | 2.2    | 3.5    | 4.5    | 13      | 21      |
| Backlash <sup>(2)</sup>                     | arcmin    | 1     | 4~10                 | ≤ 2                          | ≤ 1   | ≤ 1   | ≤ 1   | ≤ 1    | ≤ 1    | ≤ 1    | -       | -       |
|   |           | 2     | 16~100               | ≤ 3                          | ≤ 2   | ≤ 2   | ≤ 2   | ≤ 2    | ≤ 2    | ≤ 2    | ≤ 2     | ≤ 2     |
| Torsional Rigidity                          | Nm/arcmin | 1,2   | 4~100                | 8                            | 22    | 60    | 115   | 395    | 650    | 1,050  | 2,850   | 5,700   |
| Nominal Input Speed $n_{1N}$                | rpm       | 1     | 4~10                 | 5,000                        | 3,600 | 3,600 | 3,000 | 2,700  | 2,400  | 2,100  | -       | -       |
|   |           | 2     | 16~100               | 5,000                        | 4,600 | 4,600 | 4,000 | 3,700  | 3,400  | 3,100  | 2,500   | 2,000   |
| Max. Input Speed $n_{1B}$                   | rpm       | 1     | 4~10                 | 7,000                        | 6,000 | 6,000 | 5,000 | 4,500  | 4,000  | 3,500  | -       | -       |
|   |           | 2     | 16~100               | 7,000                        | 7,000 | 7,000 | 6,000 | 5,500  | 5,000  | 4,500  | 4,000   | 3,500   |
| Max. Axial Load $F_{2a}$ <sup>(4)</sup>     | N         | 1,2   | 4~100                | 1,690                        | 2,220 | 4,070 | 8,530 | 17,000 | 26,900 | 39,200 | 101,500 | 143,700 |
| Max. Bending Moment $M_{2k}$ <sup>(4)</sup> | Nm        | 1,2   | 4~100                | 120                          | 280   | 480   | 1,310 | 3,530  | 5,920  | 9,230  | 29,100  | 63,300  |
| Service Life <sup>(5)</sup>                 | hr        | 1,2   | 4~100                | 20,000                       |       |       |       |        |        |        |         |         |
| Operating Temp                              | °C        | 1,2   | 4~100                | -10° C ~ 90° C               |       |       |       |        |        |        |         |         |
| Degree of Gearbox Protection                |           | 1,2   | 4~100                | IP65                         |       |       |       |        |        |        |         |         |
| Lubrication                                 |           | 1,2   | 4~100                | Synthetic lubrication grease |       |       |       |        |        |        |         |         |
| Mounting Position                           |           | 1,2   | 4~100                | All directions               |       |       |       |        |        |        |         |         |
| Running Noise <sup>(3)</sup>                | dB(A)     | 1     | 4~10                 | ≤ 58                         | ≤ 59  | ≤ 64  | ≤ 65  | ≤ 66   | ≤ 66   | ≤ 66   | -       | -       |
|   |           | 2     | 16~100               | ≤ 58                         | ≤ 59  | ≤ 60  | ≤ 63  | ≤ 66   | ≤ 66   | ≤ 66   | ≤ 68    | ≤ 70    |
| Efficiency $\eta$                           | %         | 1     | 4~10                 | ≥ 97%                        |       |       |       |        |        |        |         |         |
|   |           | 2     | 16~100               | ≥ 94%                        |       |       |       |        |        |        |         |         |

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

(2) Backlash is measured at 2% of Nominal Output Torque  $T_{2N}$ .

(3) These values are measured by gearbox with ratio = 10 (1-stage) or ratio = 100 (2-stage) at 3,000 rpm without load, By ratio smaller than 10, the noise value would be 3-5dB higher.

(4) Applied to the output flange center at 100 rpm.

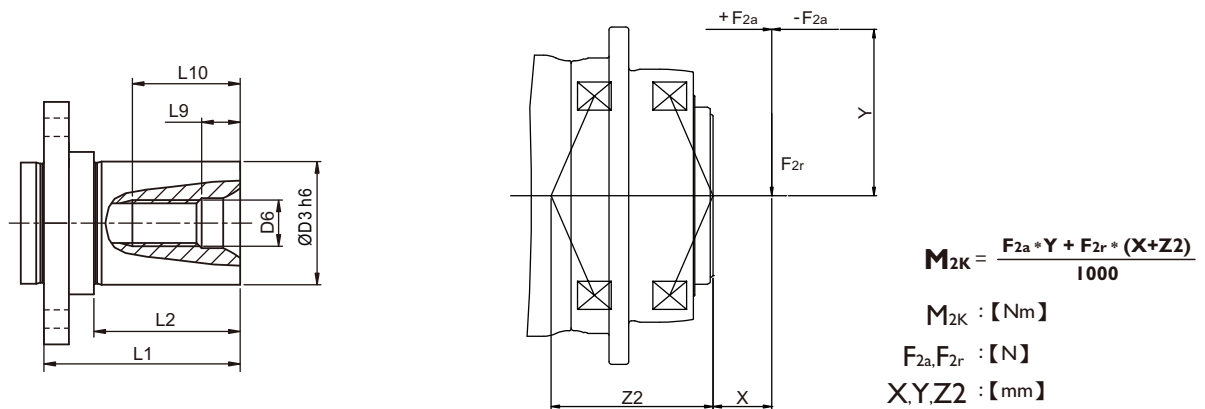
(5) Continuous operation is not recommended.

# Inertia - AH Gearbox

| Model No. | AH064 |       | AH090 |       | AH110 |       | AH140 |       | AH200 |       | AH255 |       | AH285  |       | AH355 | AH450  |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|-------|-------|--------|
|           | 1-st. | 2-st. | 1-st. | 2-st. | 1-st. | 2-st. | 1-st. | 2-st. | 1-st. | 2-st. | 1-st. | 2-st. | 1-st.  | 2-st. | 2-st. | 2-st.  |
| 8         | -     | 0.1   | -     | -     | -     | -     | -     | -     | -     | -     | -     | -     | -      | -     | -     | -      |
| 11        | 0.17  | 0.16  | -     | 0.17  | -     | -     | -     | -     | -     | -     | -     | -     | -      | -     | -     | -      |
| 14        | 0.21  | 0.2   | 0.53  | 0.21  | -     | 0.53  | -     | -     | -     | -     | -     | -     | -      | -     | -     | -      |
| 19        | 0.63  | -     | 0.68  | 0.63  | 1.83  | 0.68  | -     | 1.83  | -     | -     | -     | -     | -      | -     | -     | -      |
| 24        | -     | -     | 4.52  | -     | 5.04  | 4.52  | 5.63  | 5.04  | -     | 5.63  | -     | -     | -      | -     | -     | -      |
| 28        | -     | -     | -     | -     | 6.33  | -     | 7.18  | 6.33  | -     | 7.18  | -     | -     | -      | -     | -     | -      |
| 32        | -     | -     | -     | -     | 8.73  | -     | 10.1  | 8.73  | 12.63 | 10.1  | -     | 12.63 | -      | -     | -     | -      |
| 35        | -     | -     | -     | -     | 14.04 | -     | 15.54 | 14.04 | 17.75 | 15.54 | 17.35 | 17.75 | 28.18  | 20.8  | -     | -      |
| 38        | -     | -     | -     | -     | 19.05 | -     | 21.32 | 19.05 | 23.26 | 21.32 | 23.61 | 23.26 | 28.18  | 27.05 | 23.6  | -      |
| 42        | -     | -     | -     | -     | -     | -     | 23.2  | -     | 25.4  | 23.2  | 25.5  | 25.4  | 30.52  | 28.95 | 25.37 | 30.37  |
| 48        | -     | -     | -     | -     | -     | -     | 56.07 | -     | 61.02 | 56.07 | 61.22 | 61.02 | 66.85  | 64.66 | 89.35 | 96.45  |
| 55        | -     | -     | -     | -     | -     | -     | -     | -     | -     | -     | 88.86 | -     | 94.91  | -     | 102   | 109.06 |
| 60        | -     | -     | -     | -     | -     | -     | -     | -     | -     | -     | -     | -     | 117.73 | -     | -     | 117.75 |

(A)  $\emptyset$  = Input shaft diameter.

## Flange Shaft - AH



| Dimension | L1  | L2  | D3 h6 | D6  | L9  | L10  | Order Code    |
|-----------|-----|-----|-------|-----|-----|------|---------------|
| AH064     | 33  | 23  | 16    | M5  | 4.8 | 12.5 | FLS-AH064-S16 |
|           |     |     | 22    | M8  | 7.2 | 19   | FLS-AH064-S22 |
| AH090     | 41  | 30  | 22    | M8  | 7.2 | 19   | FLS-AH090-S22 |
|           |     |     | 32    | M12 | 10  | 28   | FLS-AH090-S32 |
| AH110     | 51  | 38  | 32    | M12 | 10  | 28   | FLS-AH110-S32 |
|           |     |     | 40    | M16 | 12  | 36   | FLS-AH110-S40 |
| AH140     | 54  | 38  | 40    | M16 | 12  | 36   | FLS-AH140-S40 |
|           |     |     | 55    | M20 | 15  | 42   | FLS-AH140-S55 |
| AH200     | 73  | 52  | 55    | M20 | 15  | 42   | FLS-AH200-S55 |
|           |     |     | 75    | M20 | 15  | 42   | FLS-AH200-S75 |
| AH255     | 150 | 123 | 90    | M24 | 18  | 50   | FLS-AH255-S90 |

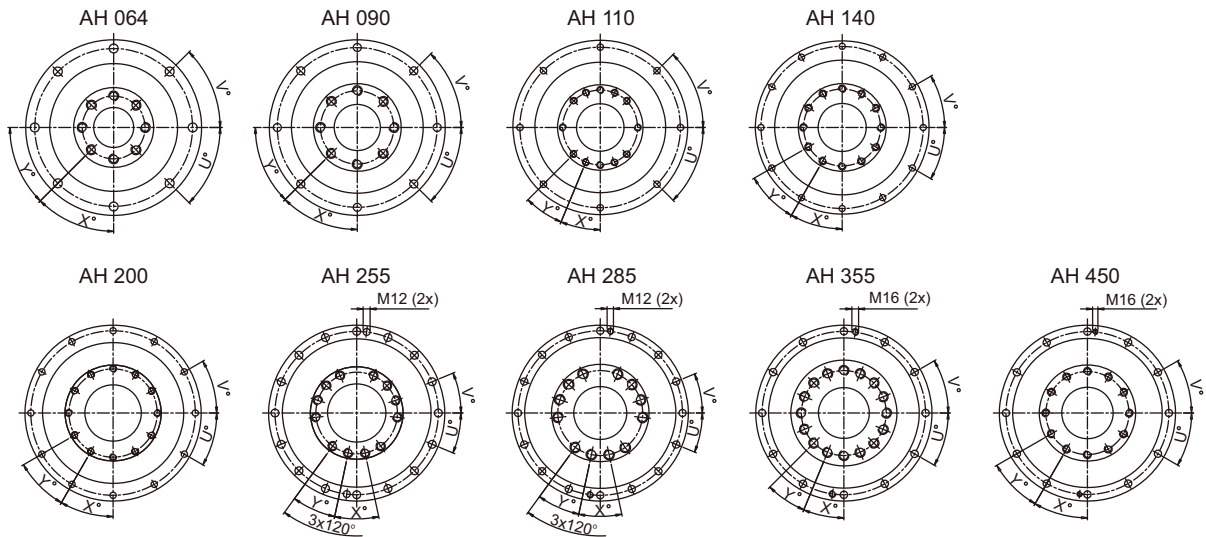
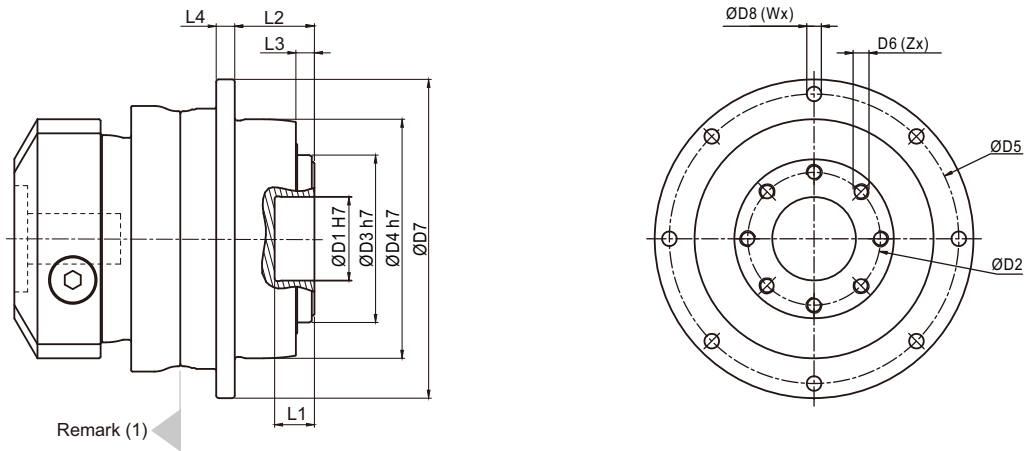
Note: Dimensions are related to gearbox flange interface.

## M2K

| AH / AHK | 064  | 090  | 110   | 140 | 200   | 255   | 285   | 355   | 450   |
|----------|------|------|-------|-----|-------|-------|-------|-------|-------|
| Z2 [mm]  | 63.7 | 84.5 | 106.2 | 90  | 122.8 | 133.2 | 175.5 | 220.6 | 275.3 |

Note : Applied to the output flange center at 100 rpm

# Dimension AH Gearbox

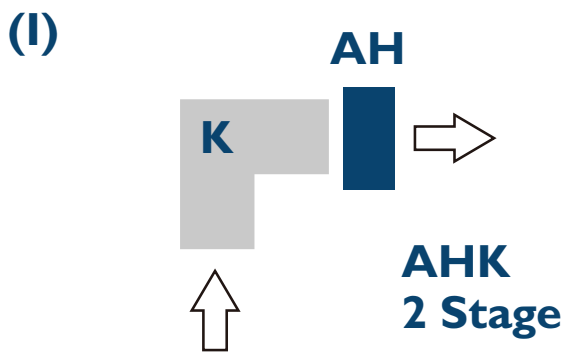


| Dimension         | AH064     | AH090    | AH110    | AH140       | AH200       | AH255     | AH285       | AH355     | AH450       |
|-------------------|-----------|----------|----------|-------------|-------------|-----------|-------------|-----------|-------------|
| D1 H7             | 20        | 31.5     | 40       | 50          | 80          | 100       | 100         | 120       | 155         |
| D2                | 31.5      | 50       | 63       | 80          | 125         | 140       | 160         | 200       | 250         |
| D3 h7             | 40        | 63       | 80       | 100         | 160         | 180       | 200         | 250       | 315         |
| D4 h7             | 64        | 90       | 110      | 140         | 200         | 255       | 285         | 355       | 450         |
| D5                | 79        | 109      | 135      | 168         | 233         | 280       | 310         | 385       | 490         |
| D6 x Pitch x Deep | M5x0.8Px8 | M6x1Px10 | M6x1Px11 | M8x1.25Px15 | M10x1.5Px20 | M16x2Px25 | M20x2.5Px31 | M24x3Px32 | M30x3.5Px40 |
| D7                | 88        | 120      | 147      | 180         | 249.5       | 302       | 332         | 415       | 530         |
| D8                | 4.5       | 5.5      | 5.5      | 6.6         | 9           | 13.5      | 13.5        | 17.5      | 22          |
| L1                | 8         | 15       | 15       | 15          | 16          | 16        | 16          | 35        | 24          |
| L2                | 19.5      | 30       | 29       | 38          | 50          | 66        | 75          | 80        | 85          |
| L3                | 4         | 7        | 7        | 7.5         | 8.5         | 13.5      | 16.5        | 20        | 20          |
| L4                | 5         | 7        | 8        | 10          | 12          | 18        | 20          | 45        | 60          |
| X in Degree       | 45        | 45       | 22.5     | 30          | 30          | 24        | 24          | 22.5      | 30          |
| Y in Degree       | 45        | 45       | 22.5     | 30          | 30          | 24        | 24          | 22.5      | 30          |
| Z                 | 8         | 8        | 12       | 12          | 12          | 12        | 12          | 16        | 12          |
| U in Degree       | 45        | 45       | 45       | 30          | 30          | 22.5      | 22.5        | 30        | 30          |
| V in Degree       | 45        | 45       | 45       | 30          | 30          | 22.5      | 22.5        | 30        | 30          |
| W                 | 8         | 8        | 8        | 12          | 12          | 16        | 16          | 12        | 12          |

Note: Dimensions are related to motor interface. Please contact APEX for details.

# AHK Gearbox

## AHK Structure



# Performance - AHK ( 2 stage ) Gearbox

| Model No.                                   | Stage     | Ratio <sup>(1)</sup> | AHK064 | AHK090                       | AHK110    | AHK140    | AHK200    | AHK255    | AHK285    | AHK355    |           |
|---|-----------|----------------------|--------|------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Nominal Output Torque $T_{2N}$              | Nm        | 2                    | 12     | 95                           | 195       | 360       | 615       | 1,315     | -         | -         | -         |
|   |           |                      | 15     | -                            | -         | -         | -         | -         | 1,770     | 3,330     | 5,595     |
|   |           |                      | 16     | 95                           | 200       | 360       | 615       | 1,320     | -         | -         | -         |
|   |           |                      | 20     | 95                           | 200       | 360       | 615       | 1,320     | 1,775     | 3,335     | 5,605     |
|   |           |                      | 25     | 80                           | 170       | 310       | 535       | 1,165     | 1,775     | 3,335     | 5,610     |
|   |           |                      | 28     | 92                           | 200       | 360       | 615       | 1,325     | -         | -         | -         |
|   |           |                      | 35     | 80                           | 170       | 310       | 535       | 1,170     | 1,775     | 3,340     | 5,615     |
|   |           |                      | 40     | 60                           | 160       | 340       | 615       | 1,325     | -         | -         | -         |
|   |           |                      | 49     | 60                           | 130       | 250       | 440       | 990       | 1,510     | 2,550     | 4,820     |
|   |           |                      | 50     | 50                           | 170       | 310       | 535       | 1,170     | 1,775     | 3,000     | 5,500     |
|   |           |                      | 70     | 60                           | 130       | 250       | 440       | 990       | 1,510     | 2,550     | 4,820     |
| 100   | 24        | 55                   | 160    | 290                          | 655       | 1,005     | 1,685     | 3,315     |           |           |           |
| Emergency Stop Torque $T_{2NOT}$            | Nm        | 2                    | 12~100 | 2 times $T_{2N}$             |           |           |           |           |           |           |           |
| Max. Acceleration Torque $T_{2B}$           | Nm        | 2                    | 12~100 | 1.5 times $T_{2N}$           |           |           |           |           |           |           |           |
| No Load Running Torque <sup>(3)</sup>       | Nm        | 2                    | 12~100 | 1                            | 1.3       | 2         | 3.1       | 6         | 13        | 16        | 20        |
| Backlash <sup>(2)</sup>                     | arcmin    | 2                    | 12~100 | $\leq 3$                     | $\leq 2$  | $\leq 2$  | $\leq 2$  | $\leq 2$  | $\leq 2$  | $\leq 2$  | $\leq 2$  |
| Torsional Rigidity                          | Nm/arcmin | 2                    | 12~100 | 12                           | 27        | 56        | 112       | 389       | 642       | 1,275     | 2,500     |
| Nominal Input Speed $n_{1N}$                | rpm       | 2                    | 12~100 | 3,000                        | 3,000     | 2,800     | 2,700     | 2,200     | 2,100     | 2,000     | 1,600     |
| Max. Input Speed $n_{1B}$                   | rpm       | 2                    | 12~100 | 6,000                        | 6,000     | 6,000     | 4,500     | 4,500     | 4,000     | 3,000     | 2,500     |
| Max. Axial Load $F_{2a}$ <sup>(4)</sup>     | N         | 2                    | 12~100 | 1,690                        | 2,220     | 4,070     | 8,530     | 17,000    | 26,900    | 39,200    | 101,500   |
| Max. Bending Moment $M_{2k}$ <sup>(4)</sup> | Nm        | 2                    | 12~100 | 120                          | 280       | 480       | 1,310     | 3,530     | 5,920     | 9,230     | 29,100    |
| Service Life <sup>(5)</sup>                 | hr        | 2                    | 12~100 | 20,000                       |           |           |           |           |           |           |           |
| Operating Temp                              | °C        | 2                    | 12~100 | -10° C ~ 90° C               |           |           |           |           |           |           |           |
| Degree of Gearbox Protection                |           | 2                    | 12~100 | IP65                         |           |           |           |           |           |           |           |
| Lubrication                                 |           | 2                    | 12~100 | Synthetic lubrication grease |           |           |           |           |           |           |           |
| Mounting Position                           |           | 2                    | 12~100 | All directions               |           |           |           |           |           |           |           |
| Running Noise <sup>(3)</sup>                | dB(A)     | 2                    | 12~100 | $\leq 64$                    | $\leq 66$ | $\leq 68$ | $\leq 68$ | $\leq 70$ | $\leq 70$ | $\leq 72$ | $\leq 74$ |
| Efficiency $\eta$                           | %         | 2                    | 12~100 | $\geq 94\%$                  |           |           |           |           |           |           |           |

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

(2) Backlash is measured at 2% of Nominal Output Torque  $T_{2N}$ .

(3) These values are measured by gearbox with ratio = 10 (1-stage) or ratio = 100 (2-stage) at 3,000 rpm without load,  
By ratio smaller than 10, the noise value would be 3-5dB higher.

(4) Applied to the output flange center at 100 rpm.

(5) Continuous operation is not recommended.

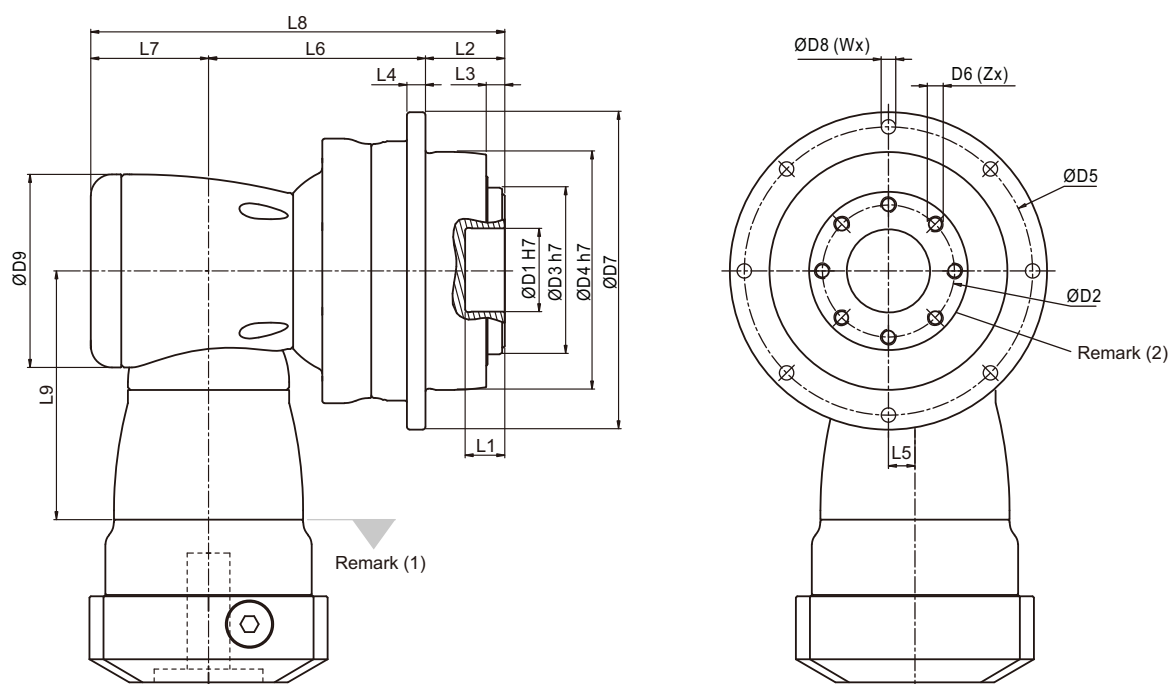
# Inertia - AHK ( 2 stage ) Gearbox

| Model No.                            | AHK064 | AHK090 | AHK110 | AHK140 | AHK200 | AHK255 | AHK285 | AHK355 |
|--------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| Input Shaft (C3) $\varnothing^{(A)}$ |        |        |        |        |        |        |        |        |
| 8                                    | 0.1    | -      | -      | -      | -      | -      | -      | -      |
| 11                                   | 0.17   | 0.18   | -      | -      | -      | -      | -      | -      |
| 14                                   | 0.21   | 0.5    | 0.52   | -      | -      | -      | -      | -      |
| 19                                   | -      | 0.65   | 1.69   | 1.71   | -      | -      | -      | -      |
| 24                                   | -      | -      | 4.89   | 5.05   | 6.92   | -      | -      | -      |
| 28                                   | -      | -      | -      | 6.55   | 6.98   | -      | -      | -      |
| 32                                   | -      | -      | -      | 9.47   | 10.18  | 10.18  | -      | -      |
| 35                                   | -      | -      | -      | 14.91  | 15.21  | 15.21  | 15.68  | -      |
| 38                                   | -      | -      | -      | 20.69  | 20.7   | 20.7   | 21.69  | 23.46  |
| 42                                   | -      | -      | -      | -      | 22.83  | 22.83  | 23.59  | 25.28  |
| 48                                   | -      | -      | -      | -      | 58.45  | 58.45  | 59.3   | 61.61  |
| 55                                   | -      | -      | -      | -      | -      | -      | -      | 89.67  |

(A)  $\varnothing$  = Input shaft diameter.



# Dimension AHK ( 2 stage ) Gearbox ( Ratio $i = 12 \sim 100$ )



| Dimension         | AHK064    | AHK090   | AHK110   | AHK140      | AHK200      | AHK255    | AHK285      | AHK355    |
|-------------------|-----------|----------|----------|-------------|-------------|-----------|-------------|-----------|
| D1 H7             | 20        | 31.5     | 40       | 50          | 80          | 100       | 100         | 120       |
| D2                | 31.5      | 50       | 63       | 80          | 125         | 140       | 160         | 200       |
| D3 h7             | 40        | 63       | 80       | 100         | 160         | 180       | 200         | 250       |
| D4 h7             | 64        | 90       | 110      | 140         | 200         | 255       | 285         | 355       |
| D5                | 79        | 109      | 135      | 168         | 233         | 280       | 310         | 385       |
| D6 x Pitch x Deep | M5x0.8Px8 | M6x1Px10 | M6x1Px11 | M8x1.25Px15 | M10x1.5Px20 | M16x2Px25 | M20x2.5Px31 | M24x3Px32 |
| D7                | 88        | 120      | 147      | 180         | 249.5       | 302       | 332         | 415       |
| D8                | 4.5       | 5.5      | 5.5      | 6.6         | 9           | 13.5      | 13.5        | 17.5      |
| D9                | 73        | 94       | 116      | 163         | 210         | 210       | 255         | 300       |
| L1                | 8         | 15       | 15       | 15          | 16          | 16        | 16          | 35        |
| L2                | 19.5      | 30       | 29       | 38          | 50          | 66        | 75          | 80        |
| L3                | 4         | 7        | 7        | 7.5         | 8.5         | 13.5      | 16.5        | 20        |
| L4                | 5         | 7        | 8        | 10          | 12          | 18        | 20          | 45        |
| L5                | 10        | 13       | 17       | 25          | 31          | 31        | 36          | 43        |
| L6                | 87        | 90.5     | 114      | 147.5       | 175         | 191.5     | 249.5       | 290       |
| L7                | 44.5      | 53       | 68.3     | 89          | 115         | 115       | 131         | 165       |
| L8                | 151       | 173.5    | 211.3    | 274.5       | 340         | 372.5     | 455.5       | 535       |
| L9                | 94        | 114.5    | 129      | 173.5       | 228         | 228       | 265.5       | 294.5     |
| X in Degree       | 45        | 45       | 22.5     | 30          | 30          | 24        | 24          | 22.5      |
| Y in Degree       | 45        | 45       | 22.5     | 30          | 30          | 24        | 24          | 22.5      |
| Z                 | 8         | 8        | 12       | 12          | 12          | 12        | 12          | 16        |
| U in Degree       | 45        | 45       | 45       | 30          | 30          | 22.5      | 22.5        | 30        |
| V in Degree       | 45        | 45       | 45       | 30          | 30          | 22.5      | 22.5        | 30        |
| W                 | 8         | 8        | 8        | 12          | 12          | 16        | 16          | 12        |

(1) Dimensions are related to motor interface. Please contact APEX for details.

(2) Refer to the AH series (Page 05) for flange interface.

# Performance - AHKA ( 3 stage ) Gearbox

| Model No.                                   | Stage     | Ratio <sup>(1)</sup> | AHKA285   | AHKA355                      | AHKA450   |           |
|---|-----------|----------------------|-----------|------------------------------|-----------|-----------|
| Nominal Output Torque $T_{2N}$              | Nm        | 3                    | 100       | 3,345                        | 5,620     | 10,965    |
|   |           |                      | 125       | 3,345                        | 5,625     | 10,970    |
|   |           |                      | 140       | 3,345                        | 5,625     | 10,970    |
|   |           |                      | 175       | 3,345                        | 5,625     | 10,970    |
|   |           |                      | 200       | 3,345                        | 5,625     | 10,975    |
|   |           |                      | 250       | 3,345                        | 5,625     | 10,975    |
|   |           |                      | 350       | 3,345                        | 5,630     | 10,975    |
|   |           |                      | 500       | 3,345                        | 5,350     | 9,050     |
|   |           |                      | 700       | 2,555                        | 4,825     | 9,600     |
|   |           | 1,000                | 1,650     | 3,250                        | 6,785     |           |
| Emergency Stop Torque $T_{2NOT}$            | Nm        | 3                    | 100~1,000 | 2 times $T_{2N}$             |           |           |
| Max. Acceleration Torque $T_{2B}$           | Nm        | 3                    | 100~1,000 | 1.5 times $T_{2N}$           |           |           |
| No Load Running Torque <sup>(3)</sup>       | Nm        | 3                    | 100~1,000 | 6                            | 6         | 13        |
| Backlash <sup>(2)</sup>                     | arcmin    | 3                    | 100~1,000 | $\leq 2$                     | $\leq 2$  | $\leq 2$  |
| Torsional Rigidity                          | Nm/arcmin | 3                    | 100~1,000 | 1,275                        | 2,500     | 5,100     |
| Nominal Input Speed $n_{1N}$                | rpm       | 3                    | 100~1,000 | 2,100                        | 2,100     | 2,000     |
| Max. Input Speed $n_{1B}$                   | rpm       | 3                    | 100~1,000 | 4,000                        | 4,000     | 3,000     |
| Max. Axial Load $F_{2a}$ <sup>(4)</sup>     | N         | 3                    | 100~1,000 | 39,200                       | 101,500   | 143,700   |
| Max. Bending Moment $M_{2k}$ <sup>(4)</sup> | Nm        | 3                    | 100~1,000 | 9,230                        | 29,100    | 63,300    |
| Service Life <sup>(5)</sup>                 | hr        | 3                    | 100~1,000 | 20,000                       |           |           |
| Operating Temp                              | °C        | 3                    | 100~1,000 | -10° C ~ 90° C               |           |           |
| Degree of Gearbox Protection                |           | 3                    | 100~1,000 | IP65                         |           |           |
| Lubrication                                 |           | 3                    | 100~1,000 | Synthetic lubrication grease |           |           |
| Mounting Position                           |           | 3                    | 100~1,000 | All directions               |           |           |
| Running Noise <sup>(3)</sup>                | dB(A)     | 3                    | 100~1,000 | $\leq 72$                    | $\leq 74$ | $\leq 76$ |
| Efficiency $\eta$                           | %         | 3                    | 100~1,000 | $\geq 92\%$                  |           |           |

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

(2) Backlash is measured at 2% of Nominal Output Torque  $T_{2N}$ .

(3) These values are measured by gearbox with ratio = 10 (1-stage) or ratio = 100 (2-stage) at 3,000 rpm without load, By ratio smaller than 10, the noise value would be 3-5dB higher.

(4) Applied to the output flange center at 100 rpm.

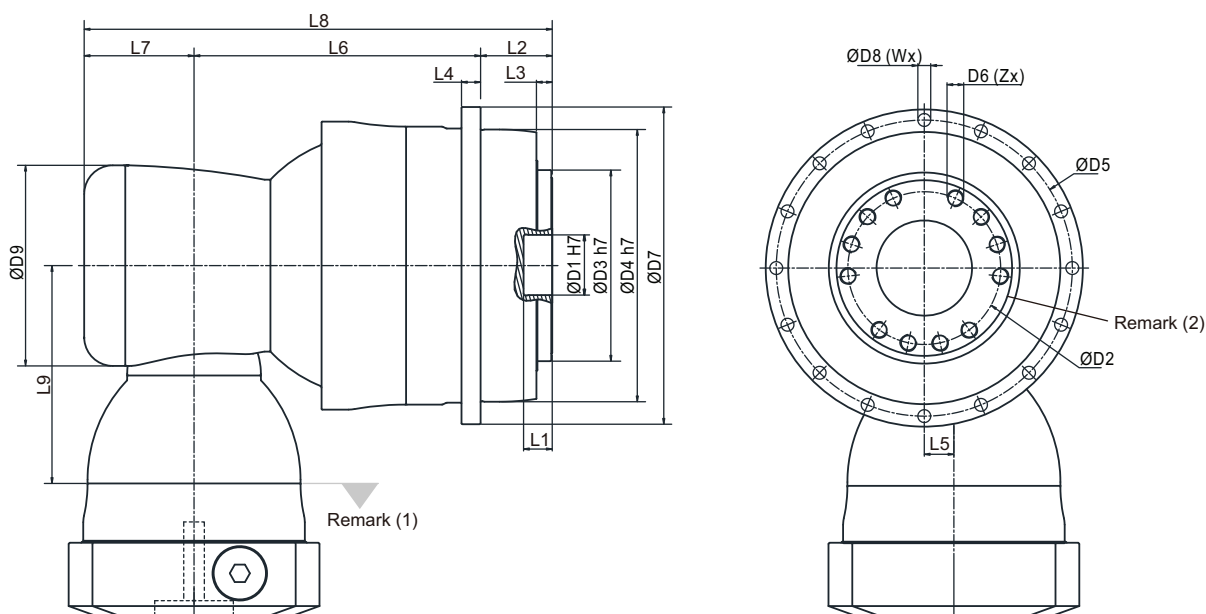
(5) Continuous operation is not recommended.

## Inertia - AHKA ( 3 stage ) Gearbox

| Model No.                            | AHKA285 | AHKA355 | AHKA450 |
|--------------------------------------|---------|---------|---------|
| Input Shaft (C3) $\varnothing^{(A)}$ |         |         |         |
| 32                                   | 10.18   | 10.18   | -       |
| 35                                   | 15.21   | 15.21   | 15.68   |
| 38                                   | 20.7    | 20.7    | 21.69   |
| 42                                   | 22.83   | 22.83   | 23.59   |
| 48                                   | 58.45   | 58.45   | 59.3    |
| 55                                   | -       | -       | 86.95   |

(A)  $\varnothing$  = Input shaft diameter.

# Dimension AHKA ( 3 stage ) Gearbox ( Ratio $i = 100\sim 1,000$ )



| Dimension         |    | AHKA285     | AHKA355   | AHKA450     |
|-------------------|----|-------------|-----------|-------------|
| D1                | H7 | 100         | 120       | 155         |
| D2                |    | 160         | 200       | 250         |
| D3                | h7 | 200         | 250       | 315         |
| D4                | h7 | 285         | 355       | 450         |
| D5                |    | 310         | 385       | 490         |
| D6 x Pitch x Deep |    | M20x2.5Px31 | M24x3Px32 | M30x3.5Px40 |
| D7                |    | 332         | 415       | 530         |
| D8                |    | 13.5        | 17.5      | 22          |
| D9                |    | 210         | 210       | 255         |
| L1                |    | 16          | 35        | 24          |
| L2                |    | 75          | 80        | 85          |
| L3                |    | 16.5        | 20        | 20          |
| L4                |    | 20          | 45        | 60          |
| L5                |    | 31          | 31        | 36          |
| L6                |    | 300         | 332       | 447.5       |
| L7                |    | 115         | 115       | 131         |
| L8                |    | 490         | 527       | 663.5       |
| L9                |    | 228         | 228       | 265.5       |
| X in Degree       |    | 24          | 22.5      | 30          |
| Y in Degree       |    | 24          | 22.5      | 30          |
| Z                 |    | 12          | 16        | 12          |
| U in Degree       |    | 22.5        | 30        | 30          |
| V in Degree       |    | 22.5        | 30        | 30          |
| W                 |    | 16          | 12        | 12          |

(1) Dimensions are related to motor interface. Please contact APEX for details.

(2) Refer to the AH series (Page 05) for flange interface.

# Performance - AHKB ( 3 stage ) Gearbox

| Model No.                                   | Stage     | Ratio <sup>(1)</sup> | AHKB090                     | AHKB110                      | AHKB140 | AHKB200 | AHKB255 | AHKB285 | AHKB355 |         |
|---|-----------|----------------------|-----------------------------|------------------------------|---------|---------|---------|---------|---------|---------|
| Nominal Output Torque $T_{2N}$              | Nm        | 3                    | 64                          | 200                          | 360     | 615     | 1,325   | -       | -       | -       |
|   |           |                      | 84                          | 200                          | 360     | 620     | 1,325   | -       | -       | -       |
|   |           |                      | 100                         | 200                          | 360     | 620     | 1,330   | 1,780   | 3,345   | 5,620   |
|   |           |                      | 125                         | 170                          | 310     | 535     | 1,170   | 1,780   | 3,345   | 5,625   |
|   |           |                      | 140                         | 200                          | 360     | 620     | 1,330   | 1,780   | 3,345   | 5,625   |
|   |           |                      | 175                         | 170                          | 310     | 535     | 1,170   | 1,780   | 3,345   | 5,625   |
|   |           |                      | 200                         | 200                          | 360     | 620     | 1,330   | 1,780   | 3,345   | 5,625   |
|   |           |                      | 250                         | 170                          | 310     | 535     | 1,170   | 1,780   | 3,345   | 5,625   |
|   |           |                      | 280                         | 200                          | 360     | 620     | 1,330   | 1,510   | -       | -       |
|   |           |                      | 350                         | 170                          | 310     | 535     | 1,170   | 1,775   | 3,345   | 5,630   |
|   |           |                      | 400                         | 160                          | 340     | 620     | 1,330   | -       | -       | -       |
|   |           |                      | 500                         | 170                          | 310     | 535     | 1,170   | 1,780   | 3,000   | 5,500   |
| 700   | 130       | 250                  | 440                         | 990                          | 1,510   | 2,555   | 4,825   |         |         |         |
| 1,000                                       | 55        | 160                  | 290                         | 640                          | 980     | 1,655   | 3,250   |         |         |         |
| Emergency Stop Torque $T_{2NOT}$            | Nm        | 3                    | 64~1,000 2 times $T_{2N}$   |                              |         |         |         |         |         |         |
| Max. Acceleration Torque $T_{2B}$           | Nm        | 3                    | 64~1,000 1.5 times $T_{2N}$ |                              |         |         |         |         |         |         |
| No Load Running Torque <sup>(3)</sup>       | Nm        | 3                    | 64~1,000                    | 0.2                          | 0.2     | 0.3     | 0.4     | 1       | 1.2     | 1.5     |
| Backlash <sup>(2)</sup>                     | arcmin    | 3                    | 64~1,000                    | ≤ 2                          | ≤ 2     | ≤ 2     | ≤ 2     | ≤ 2     | ≤ 2     | ≤ 2     |
| Torsional Rigidity                          | Nm/arcmin | 3                    | 64~1,000                    | 27                           | 56      | 112     | 389     | 642     | 1,275   | 2,500   |
| Nominal Input Speed $n_{1N}$                | rpm       | 3                    | 64~1,000                    | 5,500                        | 4,600   | 4,600   | 4,000   | 3,700   | 3,400   | 3,100   |
| Max. Input Speed $n_{1B}$                   | rpm       | 3                    | 64~1,000                    | 7,000                        | 7,000   | 7,000   | 6,000   | 5,500   | 5,000   | 4,500   |
| Max. Axial Load $F_{2a}$ <sup>(4)</sup>     | N         | 3                    | 64~1,000                    | 2,220                        | 4,070   | 8,530   | 17,000  | 26,900  | 39,200  | 101,500 |
| Max. Bending Moment $M_{2k}$ <sup>(4)</sup> | Nm        | 3                    | 64~1,000                    | 280                          | 480     | 1,310   | 3,530   | 5,920   | 9,230   | 29,100  |
| Service Life <sup>(5)</sup>                 | hr        | 3                    | 64~1,000                    | 20,000                       |         |         |         |         |         |         |
| Operating Temp                              | °C        | 3                    | 64~1,000                    | -10° C ~ 90° C               |         |         |         |         |         |         |
| Degree of Gearbox Protection                |           | 3                    | 64~1,000                    | IP65                         |         |         |         |         |         |         |
| Lubrication                                 |           | 3                    | 64~1,000                    | Synthetic lubrication grease |         |         |         |         |         |         |
| Mounting Position                           |           | 3                    | 64~1,000                    | All directions               |         |         |         |         |         |         |
| Running Noise <sup>(3)</sup>                | dB(A)     | 3                    | 64~1,000                    | ≤ 66                         | ≤ 68    | ≤ 68    | ≤ 70    | ≤ 70    | ≤ 72    | ≤ 74    |
| Efficiency $\eta$                           | %         | 3                    | 64~1,000                    | ≥ 92%                        |         |         |         |         |         |         |

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

(2) Backlash is measured at 2% of Nominal Output Torque  $T_{2N}$ .

(3) These values are measured by gearbox with ratio = 10 (1-stage) or ratio = 100 (2-stage) at 3,000 rpm without load, By ratio smaller than 10, the noise value would be 3-5dB higher.

(4) Applied to the output flange center at 100 rpm.

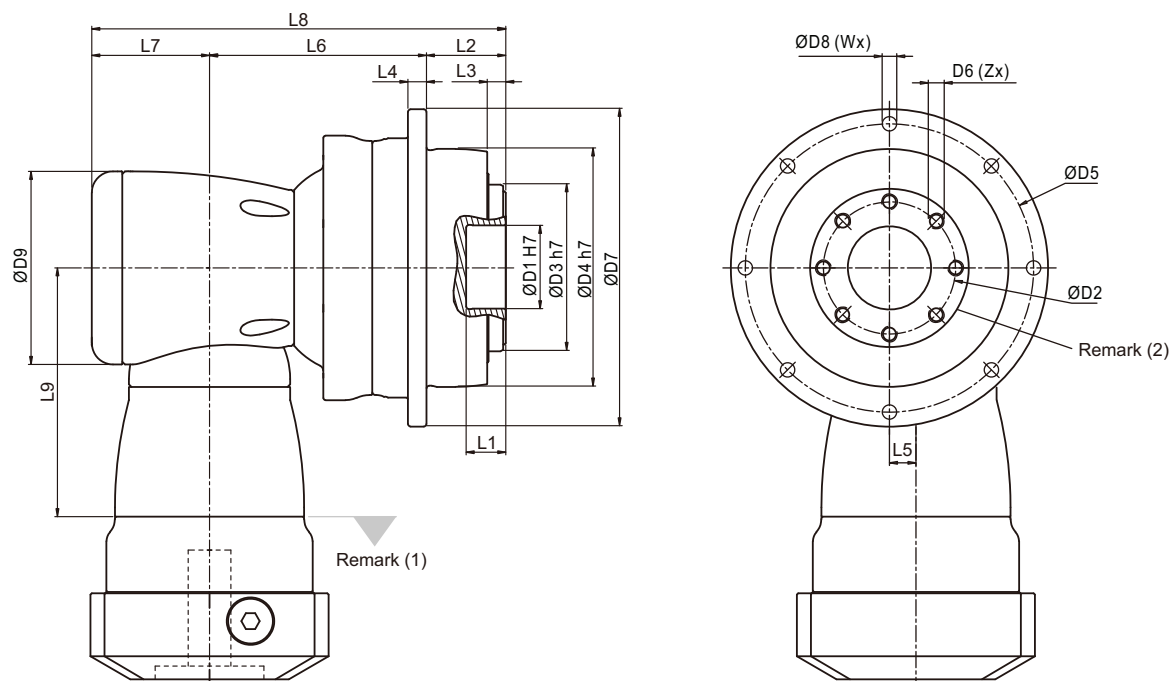
(5) Continuous operation is not recommended.

## Inertia - AHKB ( 3 stage ) Gearbox

| Model No.                            | AHKB090 | AHKB110 | AHKB140 | AHKB200 | AHKB255 | AHKB285 | AHKB355 |
|--------------------------------------|---------|---------|---------|---------|---------|---------|---------|
| Input Shaft (C3) $\varnothing^{(A)}$ |         |         |         |         |         |         |         |
| 8                                    | 0.17    | -       | -       | -       | -       | -       | -       |
| 11                                   | 0.17    | 0.52    | -       | -       | -       | -       | -       |
| 14                                   | 0.21    | 0.53    | 1.83    | -       | -       | -       | -       |
| 19                                   | -       | 0.68    | 1.83    | 5.6     | -       | -       | -       |
| 24                                   | -       | -       | 5.04    | 5.63    | 5.63    | -       | -       |
| 28                                   | -       | -       | -       | 7.18    | 7.18    | -       | -       |
| 32                                   | -       | -       | -       | 10.1    | 10.1    | 12.63   | -       |
| 35                                   | -       | -       | -       | 15.54   | 15.54   | 17.75   | 17.35   |
| 38                                   | -       | -       | -       | 21.32   | 21.32   | 23.26   | 23.61   |
| 42                                   | -       | -       | -       | -       | 23.2    | 25.4    | 25.5    |
| 48                                   | -       | -       | -       | -       | 56.07   | 61.02   | 61.22   |

(A)  $\varnothing$  = Input shaft diameter.

# Dimension AHKB ( 3 stage ) Gearbox ( Ratio $i = 64 \sim 1,000$ )



| Dimension         | AHKB090  | AHKB110  | AHKB140     | AHKB200     | AHKB255   | AHKB285     | AHKB355   |
|-------------------|----------|----------|-------------|-------------|-----------|-------------|-----------|
| D1 H7             | 31.5     | 40       | 50          | 80          | 100       | 100         | 120       |
| D2                | 50       | 63       | 80          | 125         | 140       | 160         | 200       |
| D3 h7             | 63       | 80       | 100         | 160         | 180       | 200         | 250       |
| D4 h7             | 90       | 110      | 140         | 200         | 255       | 285         | 355       |
| D5                | 109      | 135      | 168         | 233         | 280       | 310         | 385       |
| D6 x Pitch x Deep | M6x1Px10 | M6x1Px11 | M8x1.25Px15 | M10x1.5Px20 | M16x2Px25 | M20x2.5Px31 | M24x3Px32 |
| D7                | 120      | 147      | 180         | 249.5       | 302       | 332         | 415       |
| D8                | 5.5      | 5.5      | 6.6         | 9           | 13.5      | 13.5        | 17.5      |
| D9                | 94       | 116      | 163         | 210         | 210       | 255         | 300       |
| L1                | 15       | 15       | 15          | 16          | 16        | 16          | 35        |
| L2                | 30       | 29       | 38          | 50          | 66        | 75          | 80        |
| L3                | 7        | 7        | 7.5         | 8.5         | 13.5      | 16.5        | 20        |
| L4                | 7        | 8        | 10          | 12          | 18        | 20          | 45        |
| L5                | 13       | 17       | 25          | 31          | 31        | 36          | 43        |
| L6                | 90.5     | 114      | 147.5       | 175         | 191.5     | 249.5       | 290       |
| L7                | 53       | 68.3     | 89          | 115         | 115       | 131         | 165       |
| L8                | 173.5    | 211.3    | 274.5       | 340         | 372.5     | 455.5       | 535       |
| L9                | 114.5    | 129      | 173.5       | 228         | 228       | 265.5       | 294.5     |
| X in Degree       | 45       | 22.5     | 30          | 30          | 24        | 24          | 22.5      |
| Y in Degree       | 45       | 22.5     | 30          | 30          | 24        | 24          | 22.5      |
| Z                 | 8        | 12       | 12          | 12          | 12        | 12          | 16        |
| U in Degree       | 45       | 45       | 30          | 30          | 22.5      | 22.5        | 30        |
| V in Degree       | 45       | 45       | 30          | 30          | 22.5      | 22.5        | 30        |
| W                 | 8        | 8        | 12          | 12          | 16        | 16          | 12        |

(1) Dimensions are related to motor interface. Please contact APEX for details.

(2) Refer to the AH series (Page 05) for flange interface.

# Performance - AHK ( 4 stage ) Gearbox

| Model No.                                   | Stage     | Ratio <sup>(1)</sup> | AHK285             | AHK355                       | AHK450    |           |
|---|-----------|----------------------|--------------------|------------------------------|-----------|-----------|
| Nominal Output Torque $T_{2N}$              | Nm        | 4                    | 1,225              | 3,350                        | 5,630     | 10,980    |
|   |           |                      | 1,400              | 3,350                        | 5,630     | 10,980    |
|   |           |                      | 1,750              | 3,350                        | 5,630     | 10,980    |
|   |           |                      | 2,000              | 3,350                        | 5,630     | 10,980    |
|   |           |                      | 2,800              | 2,555                        | 4,825     | 9,600     |
|   |           |                      | 3,500              | 3,350                        | 5,630     | 10,980    |
|   |           |                      | 5,000              | 3,350                        | 5,350     | 9,050     |
|   |           |                      | 7,000              | 2,625                        | 4,960     | 10,115    |
|   |           | 10,000               | 1,975              | 3,870                        | 8,325     |           |
| Emergency Stop Torque $T_{2NOT}$            | Nm        | 4                    | 2 times $T_{2N}$   |                              |           |           |
| Max. Acceleration Torque $T_{2B}$           | Nm        | 4                    | 1.5 times $T_{2N}$ |                              |           |           |
| No Load Running Torque <sup>(3)</sup>       | Nm        | 4                    | 0.4                | 0.4                          | 1         |           |
| Backlash <sup>(2)</sup>                     | arcmin    | 4                    | $\leq 2$           | $\leq 2$                     | $\leq 2$  |           |
| Torsional Rigidity                          | Nm/arcmin | 4                    | 1,225~10,000       | 1,275                        | 2,500     | 5,100     |
| Nominal Input Speed $n_{iN}$                | rpm       | 4                    | 1,225~10,000       | 3,700                        | 3,700     | 3,400     |
| Max. Input Speed $n_{iB}$                   | rpm       | 4                    | 1,225~10,000       | 5,500                        | 5,500     | 5,000     |
| Max. Axial Load $F_{2a}$ <sup>(4)</sup>     | N         | 4                    | 1,225~10,000       | 39,200                       | 101,500   | 143,700   |
| Max. Bending Moment $M_{2k}$ <sup>(4)</sup> | Nm        | 4                    | 1,225~10,000       | 9,230                        | 29,100    | 63,300    |
| Service Life <sup>(5)</sup>                 | hr        | 4                    | 1,225~10,000       | 20,000                       |           |           |
| Operating Temp                              | °C        | 4                    | 1,225~10,000       | -10° C ~ 90° C               |           |           |
| Degree of Gearbox Protection                |           | 4                    | 1,225~10,000       | IP65                         |           |           |
| Lubrication                                 |           | 4                    | 1,225~10,000       | Synthetic lubrication grease |           |           |
| Mounting Position                           |           | 4                    | 1,225~10,000       | All directions               |           |           |
| Running Noise <sup>(3)</sup>                | dB(A)     | 4                    | 1,225~10,000       | $\leq 72$                    | $\leq 74$ | $\leq 76$ |
| Efficiency $\eta$                           | %         | 4                    | 1,225~10,000       | $\geq 90\%$                  |           |           |

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

(2) Backlash is measured at 2% of Nominal Output Torque  $T_{2N}$ .

(3) These values are measured by gearbox with ratio = 10 (1-stage) or ratio = 100 (2-stage) at 3,000 rpm without load, By ratio smaller than 10, the noise value would be 3-5dB higher.

(4) Applied to the output flange center at 100 rpm.

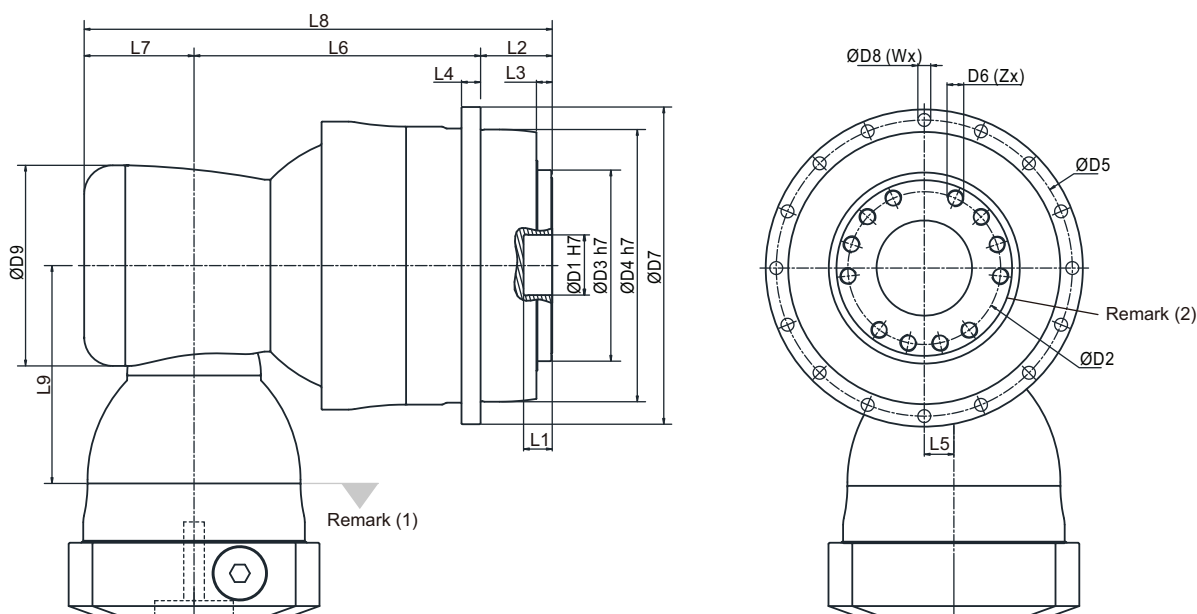
(5) Continuous operation is not recommended.

# Inertia - AHK ( 4 Stage ) Gearbox

| Model No.                            | AHK285 | AHK355 | AHK450 |
|--------------------------------------|--------|--------|--------|
| Input Shaft (C3) $\varnothing^{(A)}$ |        |        |        |
| 24                                   | 5.63   | 5.63   | -      |
| 28                                   | 7.18   | 7.18   | -      |
| 32                                   | 10.1   | 10.1   | 12.63  |
| 35                                   | 15.54  | 15.54  | 17.75  |
| 38                                   | 21.32  | 21.32  | 23.26  |

(A)  $\varnothing$  = Input shaft diameter.

# Dimension AHK ( 4 Stage ) Gearbox ( Ratio $i = 1,225 \sim 10,000$ )



| Dimension         |    | AHK285      | AHK355    | AHK450      |
|-------------------|----|-------------|-----------|-------------|
| D1                | H7 | 100         | 120       | 155         |
| D2                |    | 160         | 200       | 250         |
| D3                | h7 | 200         | 250       | 315         |
| D4                | h7 | 285         | 355       | 450         |
| D5                |    | 310         | 385       | 490         |
| D6 x Pitch x Deep |    | M20x2.5Px31 | M24x3Px32 | M30x3.5Px40 |
| D7                |    | 332         | 415       | 530         |
| D8                |    | 13.5        | 17.5      | 22          |
| D9                |    | 210         | 210       | 255         |
| L1                |    | 16          | 35        | 24          |
| L2                |    | 75          | 80        | 85          |
| L3                |    | 16.5        | 20        | 20          |
| L4                |    | 20          | 45        | 60          |
| L5                |    | 31          | 31        | 36          |
| L6                |    | 300         | 332       | 447.5       |
| L7                |    | 115         | 115       | 131         |
| L8                |    | 490         | 527       | 663.5       |
| L9                |    | 228         | 228       | 265.5       |
| X in Degree       |    | 24          | 22.5      | 30          |
| Y in Degree       |    | 24          | 22.5      | 30          |
| Z                 |    | 12          | 16        | 12          |
| U in Degree       |    | 22.5        | 30        | 30          |
| V in Degree       |    | 22.5        | 30        | 30          |
| W                 |    | 16          | 12        | 12          |

(1) Dimensions are related to motor interface. Please contact APEX for details.

(2) Refer to the AH series (Page 05) for flange interface.

# Performance AHKC Gearbox

| Model No.  |           | Stage | Ratio <sup>(1)</sup> | AHKC064                      | AHKC090 | AHKC110 | AHKC140 | AHKC200 | AHKC255 | AHKC285 | AHKC355 | AHKC450 |
|--|-----------|-------|----------------------|------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|
| Nominal Output Torque T <sub>2N</sub>              | Nm        | 2     | 4                    | 35                           | 80      | 210     | 415     | 1,005   | -       | -       | -       | -       |
|  |           |       | 5                    | 35                           | 80      | 210     | 415     | 1,005   | 2,050   | 3,250   | -       | -       |
|  |           |       | 7                    | 30                           | 70      | 180     | 350     | 820     | 1,750   | 2,410   | -       | -       |
|  |           |       | 8                    | 35                           | 80      | 210     | 415     | 1,005   | -       | -       | -       | -       |
|  |           | 3     | 10                   | 35                           | 80      | 210     | 415     | 1,005   | 2,050   | 3,250   | -       | -       |
|  |           |       | 21                   | -                            | 85      | 220     | 430     | 1,065   | 2,100   | 3,340   | 5,320   | 10,750  |
|  |           |       | 31                   | -                            | 70      | 185     | 365     | 860     | 1,790   | 2,470   | 5,720   | 9,100   |
|  |           |       | 46                   | -                            | 60      | 155     | 305     | 675     | 1,080   | 1,890   | 3,460   | 7,800   |
|  |           |       | 61                   | -                            | 70      | 185     | 365     | 860     | 1,790   | 2,470   | 5,720   | 9,100   |
|  |           |       | 91                   | -                            | 60      | 155     | 305     | 675     | 1,080   | 1,890   | 3,460   | 7,800   |
| Emergency Stop Torque T <sub>2NOT</sub>            | Nm        | 2,3   | 4~91                 | 2 times T <sub>2N</sub>      |         |         |         |         |         |         |         |         |
| Max. Acceleration Torque T <sub>2B</sub>           | Nm        | 2,3   | 4~91                 | 1.5 times T <sub>2N</sub>    |         |         |         |         |         |         |         |         |
| No Load Running Torque <sup>(3)</sup>              | Nm        | 2     | 4~10                 | 2                            | 2.5     | 5.8     | 12      | 25      | 48      | 95      | -       | -       |
|  |           | 3     | 21~91                | 1                            | 1.5     | 2.5     | 4       | 9       | 18.5    | 35      | 75      | 148     |
| Backlash <sup>(2)</sup>                            | arcmin    | 2     | 4~10                 | ≤ 3                          | ≤ 2     | ≤ 2     | ≤ 2     | ≤ 2     | ≤ 2     | ≤ 2     | -       | -       |
|  |           | 3     | 21~91                | -                            | ≤ 2     | ≤ 2     | ≤ 2     | ≤ 2     | ≤ 2     | ≤ 2     | ≤ 2     | ≤ 2     |
| Torsional Rigidity                                 | Nm/arcmin | 2,3   | 4~91                 | 12                           | 27      | 56      | 112     | 389     | 642     | 1,275   | 2,500   | 5,100   |
| Nominal Input Speed n <sub>1N</sub>                | rpm       | 2     | 4~10                 | 5,000                        | 3,600   | 3,000   | 2,300   | 1,800   | 1,500   | 1,100   | -       | -       |
|  |           | 3     | 21~91                | -                            | 4,600   | 4,000   | 3,000   | 2,300   | 1,800   | 1,500   | 1,500   | 1,100   |
| Max. Input Speed n <sub>1B</sub>                   | rpm       | 2     | 4~10                 | 7,000                        | 6,000   | 5,500   | 4,500   | 3,500   | 3,000   | 2,200   | -       | -       |
|  |           | 3     | 21~91                | -                            | 7,000   | 6,500   | 5,500   | 4,500   | 3,500   | 3,000   | 3,000   | 2,200   |
| Max. Axial Load F <sub>2a</sub> <sup>(4)</sup>     | N         | 2,3   | 4~91                 | 1,690                        | 2,220   | 4,070   | 8,530   | 17,000  | 26,900  | 39,200  | 101,500 | 143,700 |
| Max. Bending Moment M <sub>2k</sub> <sup>(4)</sup> | Nm        | 2,3   | 4~91                 | 120                          | 280     | 480     | 1,310   | 3,530   | 5,920   | 9,230   | 29,100  | 63,300  |
| Service Life <sup>(5)</sup>                        | hr        | 2,3   | 4~91                 | 20,000                       |         |         |         |         |         |         |         |         |
| Operating Temp                                     | °C        | 2,3   | 4~91                 | -10° C ~ 90° C               |         |         |         |         |         |         |         |         |
| Degree of Gearbox Protection                       |           | 2,3   | 4~91                 | IP65                         |         |         |         |         |         |         |         |         |
| Lubrication  |           | 2,3   | 4~91                 | Synthetic lubrication grease |         |         |         |         |         |         |         |         |
| Mounting Position                                  |           | 2,3   | 4~91                 | All directions               |         |         |         |         |         |         |         |         |
| Running Noise <sup>(3)</sup>                       | dB(A)     | 2     | 4~10                 | ≤ 68                         | ≤ 68    | ≤ 68    | ≤ 70    | ≤ 70    | ≤ 72    | ≤ 74    | -       | -       |
|  |           | 3     | 21~91                | -                            | ≤ 68    | ≤ 68    | ≤ 70    | ≤ 70    | ≤ 72    | ≤ 74    | ≤ 74    | ≤ 76    |
| Efficiency η                                       | %         | 2     | 4~10                 | ≥ 95%                        |         |         |         |         |         |         |         |         |
|  |           | 3     | 21~91                | ≥ 93%                        |         |         |         |         |         |         |         |         |

(1) Ratio (i = N<sub>in</sub> / N<sub>out</sub>).

(2) Backlash is measured at 2% of Nominal Output Torque T<sub>2N</sub>.

(3) These values are measured by gearbox with ratio = 10 (1-stage) or ratio = 100 (2-stage) at 3,000 rpm without load, By ratio smaller than 10, the noise value would be 3-5dB higher.

(4) Applied to the output flange center at 100 rpm.

(5) Continuous operation is not recommended.

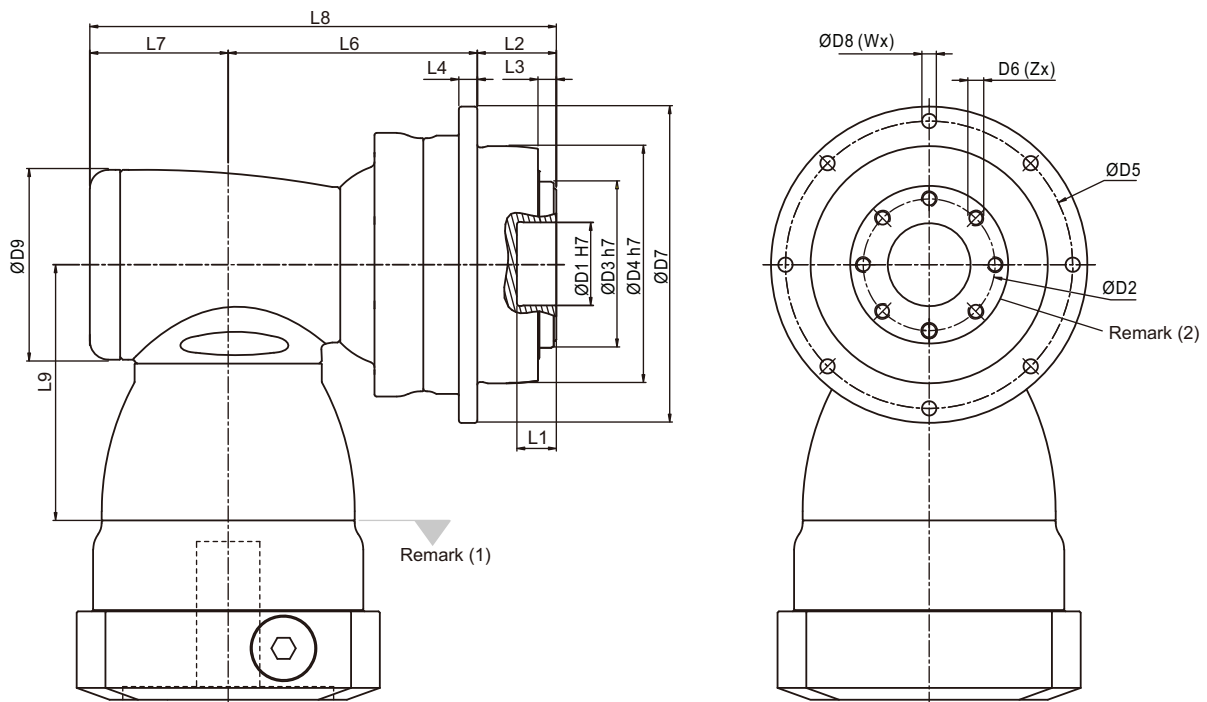
## Inertia AHKC Gearbox (Ratio i = 4~10 / 21~91)

| Model No.             |                    | AHKC064 | AHKC090 | AHKC110 | AHKC140 | AHKC200 | AHKC255 | AHKC285 | AHKC355 | AHKC450 |       |        |       |       |       |       |        |
|-----------------------|--------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|-------|--------|-------|-------|-------|-------|--------|
| ∅ <sup>(A)</sup> (C3) |                    | 2-st.   | 2-st.   | 3-st.   | 2-st.   | 3-st.   | 2-st.   | 3-st.   | 2-st.   | 3-st.   | 2-st. | 3-st.  | 2-st. | 3-st. | 3-st. | 3-st. |        |
| 8                     | kg.cm <sup>2</sup> | 0.1     | -       | 0.1     | -       | -       | -       | -       | -       | -       | -     | -      | -     | -     | -     | -     |        |
| 11                    |                    | 0.17    | 0.52    | 0.17    | -       | -       | -       | -       | -       | -       | -     | -      | -     | -     | -     | -     | -      |
| 14                    |                    | 0.21    | 0.52    | 0.21    | -       | 0.52    | -       | -       | -       | -       | -     | -      | -     | -     | -     | -     | -      |
| 19                    |                    | 0.62    | 1.69    | 0.62    | 1.71    | 1.69    | -       | 1.71    | -       | -       | -     | -      | -     | -     | -     | -     | -      |
| 24                    |                    | -       | 4.89    | -       | 5.05    | 4.89    | 6.92    | 5.05    | -       | 6.92    | -     | -      | -     | -     | -     | -     | -      |
| 28                    |                    | -       | -       | -       | 6.55    | -       | 6.98    | 6.55    | -       | 6.98    | -     | -      | -     | -     | -     | -     | -      |
| 32                    |                    | -       | -       | -       | 9.47    | -       | 10.18   | 9.47    | 10.18   | 10.18   | -     | 10.18  | -     | -     | -     | -     | -      |
| 35                    |                    | -       | -       | -       | 14.91   | -       | 15.21   | 14.91   | 15.21   | 15.68   | 15.21 | 23.46  | 15.68 | -     | -     | -     | -      |
| 38                    |                    | -       | -       | -       | 20.69   | -       | 20.7    | 20.69   | 20.7    | 21.69   | 20.7  | 23.46  | 21.69 | 21.69 | -     | -     | -      |
| 42                    |                    | -       | -       | -       | -       | -       | 22.83   | -       | 22.83   | 22.83   | 23.59 | 22.83  | 23.59 | 23.59 | 23.59 | 25.28 | 25.28  |
| 48                    |                    | -       | -       | -       | -       | -       | 58.45   | -       | 58.45   | 58.45   | 59.3  | 58.45  | 61.61 | 59.3  | 59.3  | 61.61 | 61.61  |
| 55                    |                    | -       | -       | -       | -       | -       | -       | -       | -       | 86.95   | -     | 89.67  | -     | 86.95 | 86.95 | 89.67 | 89.67  |
| 60                    |                    | -       | -       | -       | -       | -       | -       | -       | -       | -       | -     | 112.49 | -     | -     | -     | -     | 112.49 |

(A) ∅ = Input shaft diameter.



# Dimension AHKC Gearbox (Ratio $i=4\sim 10 / 21\sim 91$ )

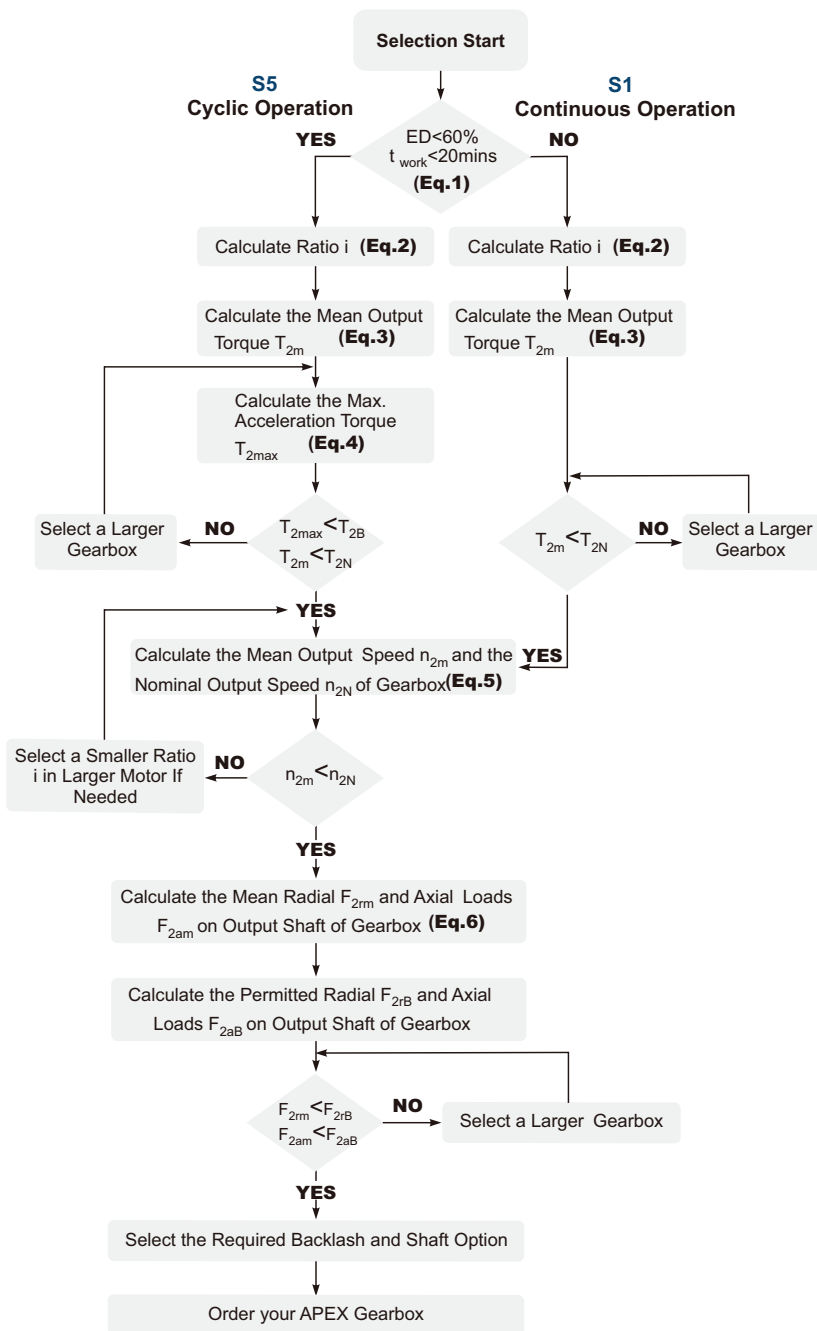


| Dimension         | AHKC064   |          | AHKC090  |             | AHKC110     |           | AHKC140     |           | AHKC200     |       | AHKC255 |       | AHKC285 |       | AHKC355 | AHKC450 |
|-------------------|-----------|----------|----------|-------------|-------------|-----------|-------------|-----------|-------------|-------|---------|-------|---------|-------|---------|---------|
|                   | 2-st.     | 3-st.    | 2-st.    | 3-st.       | 2-st.       | 3-st.     | 2-st.       | 3-st.     | 2-st.       | 3-st. | 2-st.   | 3-st. | 2-st.   | 3-st. | 3-st.   | 3-st.   |
| D1 H7             | 20        | 31.5     | 40       | 50          | 80          | 100       | 100         | 120       | 155         |       |         |       |         |       |         |         |
| D2                | 31.5      | 50       | 63       | 80          | 125         | 140       | 160         | 200       | 250         |       |         |       |         |       |         |         |
| D3 h7             | 40        | 63       | 80       | 100         | 160         | 180       | 200         | 250       | 315         |       |         |       |         |       |         |         |
| D4 h7             | 64        | 90       | 110      | 140         | 200         | 255       | 285         | 355       | 450         |       |         |       |         |       |         |         |
| D5                | 79        | 109      | 135      | 168         | 233         | 280       | 310         | 385       | 490         |       |         |       |         |       |         |         |
| D6 x Pitch x Deep | M5x0.8Px8 | M6x1Px10 | M6x1Px11 | M8x1.25Px15 | M10x1.5Px20 | M16x2Px25 | M20x2.5Px31 | M24x3Px32 | M30x3.5Px40 |       |         |       |         |       |         |         |
| D7                | 88        | 120      | 147      | 180         | 249.5       | 302       | 332         | 415       | 530         |       |         |       |         |       |         |         |
| D8                | 4.5       | 5.5      | 5.5      | 6.6         | 9           | 13.5      | 13.5        | 17.5      | 22          |       |         |       |         |       |         |         |
| D9                | 64        | 92       | 64       | 116         | 92          | 156       | 116         | 156       | 156         | 195   | 156     | 240   | 195     | 195   | 240     |         |
| L1                | 8         | 15       | 15       | 15          | 16          | 16        | 16          | 35        | 24          |       |         |       |         |       |         |         |
| L2                | 19.5      | 30       | 29       | 38          | 50          | 66        | 75          | 80        | 85          |       |         |       |         |       |         |         |
| L3                | 4         | 7        | 7        | 7.5         | 8.5         | 13.5      | 16.5        | 20        | 20          |       |         |       |         |       |         |         |
| L4                | 5         | 7        | 8        | 10          | 12          | 18        | 20          | 45        | 60          |       |         |       |         |       |         |         |
| L6                | 92        | 100.5    | 121.5    | 124.5       | 142         | 175.5     | 174.5       | 185       | 244.5       | 199   | 264.5   | 265.5 | 307.5   | 339.5 | 463.5   |         |
| L7                | 46.5      | 61.5     | 46.5     | 76          | 61.5        | 97.5      | 76          | 97.5      | 97.5        | 105.5 | 97.5    | 141   | 105.5   | 105.5 | 141     |         |
| L8                | 158       | 192      | 198      | 229.5       | 232.5       | 311       | 288.5       | 332.5     | 392         | 370.5 | 428     | 481.5 | 488     | 525   | 689.5   |         |
| L9                | 81.5      | 113.5    | 81.5     | 147.5       | 113.5       | 196.5     | 147.5       | 196.5     | 196.5       | 229   | 196.5   | 260   | 229     | 229   | 260     |         |
| X in Degree       | 45        | 45       | 22.5     | 30          | 30          | 24        | 24          | 22.5      | 30          |       |         |       |         |       |         |         |
| Y in Degree       | 45        | 45       | 22.5     | 30          | 30          | 24        | 24          | 22.5      | 30          |       |         |       |         |       |         |         |
| Z                 | 8         | 8        | 12       | 12          | 12          | 12        | 12          | 16        | 12          |       |         |       |         |       |         |         |
| U in Degree       | 45        | 45       | 45       | 30          | 30          | 22.5      | 22.5        | 30        | 30          |       |         |       |         |       |         |         |
| V in Degree       | 45        | 45       | 45       | 30          | 30          | 22.5      | 22.5        | 30        | 30          |       |         |       |         |       |         |         |
| W                 | 8         | 8        | 8        | 12          | 12          | 16        | 16          | 12        | 12          |       |         |       |         |       |         |         |

(1) Dimensions are related to motor interface. Please contact APEX for details.

(2) Refer to the AH series (Page 05) for flange interface.

# Selection of the optimum gearbox



**Recommended (for S5 Cycle Operation)**

The general design is given for

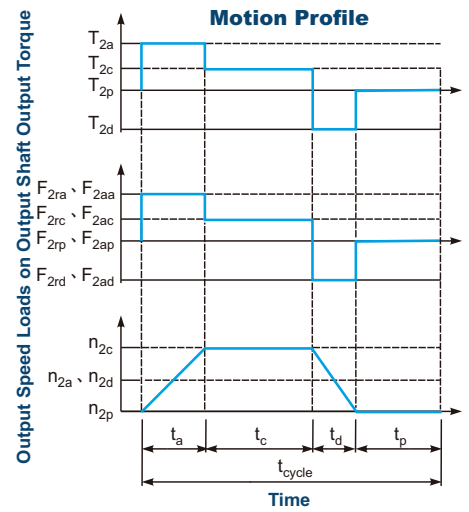
$$\frac{J_L}{i^2} \leq 4 \times J_m$$

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)**

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

**(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)**

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

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

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

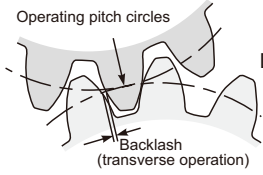
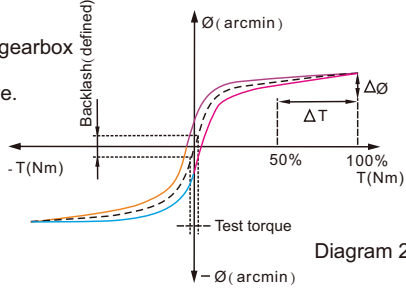
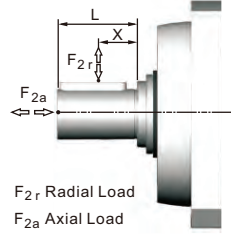
**(Eq.5)**

$$6. F_{2m} = 3 \sqrt{\frac{n_{2a} \times t_a \times F_{2aa}^3 + n_{2c} \times t_c \times F_{2ac}^3 + n_{2d} \times t_d \times F_{2ad}^3}{n_{2a} \times t_a + n_{2c} \times t_c + n_{2d} \times t_d}}$$

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

**(Eq.6)**

# Glossary

|                                   |                    |   |
|-----------------------------------|--------------------|---|
| Emergency Stop Torque $T_{2NOT}$  | Nm                 | The Emergency Stop Torque is the maximum permitted torque at the output of gearbox. This may happen only occasionally and may not exceed 1,000 times during the whole service life.   |
| Max. Acceleration Torque $T_{2B}$ | Nm                 | Under the Cyclic Operation (S5), the Max. Acceleration Torque is the maximum torque which can be transmitted only briefly to the output of gearbox up to 1,000 cycles/hr.   |
| No Load Running Torque            | Nm                 | The No Load Running Torque is the min. torque to overcome the internal friction of a gearbox without loading*.  |
| Nominal Input Speed $n_{1N}$      | rpm                | The Nominal Input Speed is the permitted input speed of gearbox by the Continuous Operation (S1) while the housing temperature does not exceed 90°C. This value is measured at environment temperature 25°C.  |
| Max. Input Speed $n_{1B}$         | rpm                | The Max. Input Speed is the max. permitted input speed of gearbox by the Cyclic operation (S5). This value is measured at environment temperature 25°C and serves as the absolute limit of the gearbox.   |
| Backlash                          | arcmin             | <p>The Backlash is the maximum angular measurement between two teeth of gears when the transverse operation occurs (refer to Diagram 1). The arcmin is the measurement unit for the backlash. One arcmin equals 1/ 60 degree, symbolized as 1'.</p>  <p>Diagram 1</p>  |
| Torsional Rigidity                | Nm/arcmin          | <p>Torsional Rigidity is the quotient (<math>\Delta T / \Delta \theta</math>) between the applied torque and resulting torsion angle. This value indicates how much torque is needed on the gearbox to rotate the output shaft for 1 arcmin. The Torsional Rigidity can be determined by Hysteresis Curve.</p> <p><b>Hysteresis Curve</b><br/>When the input shaft is locked, increase torque at the output slowly up to <math>T_{2B}</math> in both directions and then release the torque gradually. According to the measured torque and torsion angle, a closed curve will be acquired as in the Diagram 2.</p>  <p>Diagram 2</p> |
| Radial Load And Axial Load        | N                  | <p>The permitted radial and axial loads on output shaft of the gearbox depend on the design of the gearbox supporting bearings.</p> <p>For more information, please refer to APEX website.</p>  <p><math>F_{2r}</math> Radial Load<br/><math>F_{2a}</math> Axial Load</p>  |
| Efficiency $\eta$                 | %                  | The transmission efficiency of the gears inside a gearbox (without friction).   |
| Operating Temperature             | ° C                | The Operating Temperature indicates the temperature of gearbox housing.   |
| Degree of Protection              |                    | IP code stands for International Protection standard. The IP65 as example: the first IP number stands for protection degree against dust; the second IP number stands for protection against liquid.  |
| Lubrication                       |                    | APEX uses synthetic lubrication grease. Alternate greases are available, please contact APEX.   |
| Running Noise                     | dB(A)              | The Running Noise is measured depends on gearbox size, the ratio and the speed*. Higher speed usually induces higher noise level, while higher ratio induces lower noise level.   |
| Moment of Inertia $J_1$           | kg.cm <sup>2</sup> | The Moment of Inertia $J_1$ is a measurement of the effort applied to an object to maintain its momentary condition at rest or rotating.  |
| Breakaway Torque                  | Nm                 | The Breakaway Torque is the minimum torque to start the rotation from the input side of gearbox. A smaller size or a higher ratio gearbox requests less Breakaway Torque.   |
| Back Driving Torque               | Nm                 | The Back Driving Torque is the minimum torque to start the rotation from the output side of gearbox. A larger size or a higher ratio gearbox requires greater Back Driving Torque.  |

\* This value is measured at environment temperature 25°C and the input speed 3,000 rpm. If the Nominal Input Speed  $n_{1N}$  of gearbox is lower than 3,000 rpm, this value is measured by that specific Nominal Input Speed.



**APEX TAIWAN NORTH  
ANDTEK AUTOMATION CO.,LTD**  
TEL +886-02-82262655  
13F-5, No.2, Jian 8th Rd., Jhonghe Dist., New  
Taipei City 235, TAIWAN  
sales@andtek.com.tw  
www.apexdyna.com



**APEX TAIWAN CENTRAL  
ANDTEK AUTOMATION CO.,LTD**  
TEL +886-04-23594286  
9F-6, No.925, Sec.4, Taiwan Blvd., Xitun Dist.  
Taichung City 407 TAIWAN  
sales@andtek.com.tw  
www.apexdyna.com



**APEX TAIWAN SOUTH  
MEN JENN ELECTRIC CO., LTD.**  
TEL +886-06-2337332 ~ 6  
No.774, Zhonghua Rd., Yongkang Dist., Tainan  
City 710, TAIWAN  
menjenn@ms24.hinet.net  
www.apexdyna.com



**APEX DYNAMICS INC. SHANGHAI**  
TEL +86-21-69220577  
No.128 ZHUYING Road QINGPU Industry Area,  
Shanghai, CHINA  
sales@apexdyna.cn  
www.apexdyna.cn



**APEX DYNAMICS SHENZHEN, LTD.**  
TEL +86-755-84516325  
No. 1102A of D area , CFG mansion ,Bao Yuan  
Road , Bao'an District , Shenzhen ,CHINA.  
sales@szapexdyna.com  
www.szapexdyna.com



**APEX DYNAMICS BEIJING, LTD.**  
TEL +86-10-69570691  
NO.1,YaoPingRoad,SongZhuang Town, Tongzhou  
istrict, Beijing, CHINA.  
bjapexdyna@163.com  
www.biapex.cn



**CHONGQING APEX DYNAMICS CO., LTD.**  
TEL +86-23-67686860  
406, Building 5, No.68,Jinyu Avenue, Beibu New  
Area, Chongqing, CHINA  
sales@cqapexdyna.com  
www.apexdyna.com



**APEX (XIAMEN) DYNAMICS TECHNOLOGY CO., LTD.**  
TEL +86-0592-720-5279  
Unit B-3,1F., No.129,Jingquan Road, Jimei District,  
Xiamen, Fujian, CHINA  
sales@xmmapexdyna.com  
www.xmapexdyna.com



**APEX DYNAMICS USA, INC.**  
TEL +1-631-2449040  
885 Marconi Avenue Ronkonkoma, NY 11779  
U.S.A.  
sales@apexdynamicsusa.com  
www.apexdynamicsusa.com



**APEX DYNAMICS KOREA**  
TEL +82-31-8179992  
1246-32, Seongsuk-dong, Ilsandong-gu, Goyang-city,  
Gyeonggi-Do, KOREA (R.O.K) 410-570  
sales@apexdynakorea.co.kr  
www.apexdynakorea.co.kr



**APEX DYNAMICS JAPAN**  
TEL +81-092-4511202  
1-13-3, Sannou, Hakata-ku, Fukuoka-Shi 812-0015,  
JAPAN  
sales@apexdyna.jp  
www.apexdyna.jp



**APEX DYNAMICS SINGAPORE PTE LTD**  
TEL +65-62-626228  
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www.apexdyna.com.sg



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AUSTRALIA.  
sales@apexdyna.com.au  
www.apexdyna.com.au



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www.apexdyna.co.in



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Bievres, FRANCE  
info@apexdyna.fr  
www.apexdyna.fr



**APEX DYNAMICS SWEDEN AB**  
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sales@apexdyna.se  
www.apexdyna.se



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Rukan Aralia Blok HY43 no.11, Harapan Indah II,  
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www.apexdyna.co.id



**APEX DYNAMICS GERMANY GMBH**  
TEL +49-7181-9329955  
Spanninger Str. 9, 73650 Winterbach, GERMANY  
Langer@apexdynamics.de  
www.apexdynamics.de



**APEX DYNAMICS CZECH S.R.O.**  
TEL +420-577-663877  
tř. Tomáše Bati 1851 765 02 Otrokovice ČESKÁ  
REPUBLIKA  
info@apexdynczech.cz  
www.apexdynczech.cz



**APEX DYNAMICS РОССИЯ**  
TEL +7-495-2255452  
+7-495-6462422  
г.Москва, ул. Южнопортовая, дом 7, строение  
„С“, 3-й этаж  
info@apexdynarussia.ru  
www.apexdynarussia.ru



**APEX DYNAMICS UK LIMITED**  
TEL +44-1827-253340  
2 Centurion Way, Centurion Park, Tamworth  
Staffs, B77 5PN, UK  
sales@apexdynamicsuk.com  
www.apexdynamicsuk.com



**APEX DYNAMICS SWITZERLAND AG**  
TEL +41-55-4517020 Talstrasse 24, CH-8852  
Altendorf, SWITZERLAND  
info@apexdyna.ch  
www.apexdyna.ch



**APEX DYNAMICS MOTION SDN BHD**  
TEL +60 7237 1055  
No.1, Jalan Perniagaan Setia 3, Taman  
Perniagaan Setia, 81100 Johor Bahru, Johor,  
MALAYSIA (Setia Business Park 2 @ Iskandar  
Malaysia)  
sales@apexdyna.com.sg  
www.apexdyna.com.sg



**APEX DYNAMICS BRAZIL**  
TEL +55-47-30298700  
Rua Senador Petrônio Portela, 47 - Bloco 5, Zona  
Industrial Norte - CEP 89218-575 - Joinville (SC)  
lucan@neoyama.com.br  
adriano.duarte@neoyama.com.br  
www.neoyama.com.br



**APEX DYNAMICS ITALY**  
TEL +39 02.36634521  
VIA E. DE AMICIS, 2 – 20091 BRESSO (MI)  
info@apexdynamics.it  
www.apexdynamics.it



**APEX DYNAMICS, INC.**

No10. Keyuan 3rd RD.Situn District, Taichung City 40763, Taiwan (R.O.C)  
Tel:886-4-24650219 | Fax:886-4-24650118  
sales@apexdyna.com | http://www.apexdyna.com

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