# APEX DYNAMICS, INC.

## HIGH PRECISION PLANETARY GEARBOX

## AFH / AFHK Series

# Gearbox Series - AFH / AFHK

## ▶ Features:

High Torque
Optimized Output Torque & Inertia Moment
High Precision / Low Backlash
Long Service Life
Low Noise
Limited Temperature Rise

# Ordering Code - AFH / AFHK Series

| AFH075 | — | 003 | — | S1 | / | MOTOR |
|--------|---|-----|---|----|----|--------|

| Motor Type |

| Shaft Type |

| Ratio |

| Gearbox Size |

**Gearbox Size**
**AFH** 060 / 075 / 100 / 140 / 180 / 210 / 240
**AFHK** 060 / 075 / 100 / 140 / 180 / 210 / 240

**Ratio**[1]
**AFH** (1 Stg.) 3 / 4 / 5 / 7 / 10
(2 Stg.) 16 / 20 / 25 / 28 / 35 / 40 / 50 / 70 / 100
**AFHK** (2 Stg.) 12 / 16 / 20 / 25 / 28 / 35 / 40 / 50 / 70 / 100
**AFHKA** (3 Stg.) 100 / 125 / 140 / 175 / 200 / 250 / 350 / 400 / 500 / 700 / 1,000
**AFHKB** (3 Stg.) 48 / 64 / 84 / 100 / 125 / 140 / 175 / 200 / 250 / 280 / 350 / 400 / 500
700 / 1,000
**AFHK** (4 Stg.) 1,225 / 1,400 / 1,750 / 2,000 / 2,800 / 3,500 / 5,000 / 7,000 / 10,000
**AFHKC** (2 Stg.) 4 / 5 / 7 / 8 / 10

**Shaft Type : S1 = Smooth Output Shaft**
**S2 = Output Shaft with Key**
**S3 = DIN5480 Output Shaft**
**S4 = Hollow Output Shaft**

**Motor Type : Manufacturer and Model**

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

# Performance - AFH Gearbox

| Model No. | | Stage | Ratio[1] | AFH 060 | AFH 075 | AFH 100 | AFH 140 | AFH 180 | AFH 210 | AFH 240 |
|---|---|---|---|---|---|---|---|---|---|---|
| Nominal Output Torque $T_{2N}$ | Nm | 1 | 3 | 85 | 150 | 415 | 630 | 1,485 | 2,255 | 4,090 |
| | | | 4 | 95 | 195 | 350 | 600 | 1,290 | 1,960 | 3,715 |
| | | | 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 | 2,000 | 3,785 |
| | | | 20 | 95 | 200 | 360 | 615 | 1,320 | 2,000 | 3,800 |
| | | | 25 | 80 | 165 | 310 | 535 | 1,165 | 1,770 | 3,330 |
| | | | 28 | 60 | 200 | 360 | 615 | 1,325 | 2,000 | 3,800 |
| | | | 35 | 70 | 170 | 310 | 535 | 1,165 | 1,775 | 3,335 |
| | | | 40 | 40 | 96 | 220 | 615 | 1,215 | 2,000 | 3,805 |
| | | | 50 | 50 | 120 | 275 | 535 | 1,170 | 1,775 | 3,340 |
| | | | 70 | 60 | 130 | 250 | 440 | 990 | 1,510 | 2,550 |
| | | | 100 | 24 | 55 | 160 | 295 | 660 | 1,005 | 1,700 |
| Emergency Stop Torque $T_{2NOT}$ | Nm | 1,2 | 3~100 | 3 times $T_{2N}$ | | | | | | |
| Max. Acceleration Torque $T_{2B}$ | Nm | 1,2 | 3~100 | 1.5 times $T_{2N}$ | | | | | | |
| No Load Running Torque[2] | Nm | 1 | 3~10 | 0.3 | 0.6 | 1.4 | 2.5 | 5 | 7 | 11 |
| | | 2 | 16~100 | 0.2 | 0.3 | 0.5 | 1.2 | 1.7 | 3 | 4 |
| Backlash[3] | arcmin | 1 | 3~10 | ≦ 2 | ≦ 1 | ≦ 1 | ≦ 1 | ≦ 1 | ≦ 1 | ≦ 1 |
| | | 2 | 16~100 | ≦ 3 | ≦ 2 | ≦ 2 | ≦ 2 | ≦ 2 | ≦ 2 | ≦ 2 |
| Torsional Rigidity | Nm/arcmin | 1,2 | 3~100 | 4.6 | 10 | 30 | 55 | 175 | 400 | 550 |
| Nominal Input Speed $n_{IN}$ | rpm | 1 | 3~10 | 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 |
| Max. Input Speed $n_1$ | rpm | 1 | 3~10 | 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 |
| Max. Radial Load $F_r$[4] | N | 1,2 | 3~100 | 3,000 | 4,500 | 6,700 | 10,000 | 15,000 | 22,000 | 30,000 |
| Max. Axial Load $F_{2a}$[4] | N | 1,2 | 3~100 | 1,500 | 2,250 | 3,350 | 5,000 | 7,500 | 11,000 | 15,000 |
| Max. Tilting Moment $M_{2K}$[4] | Nm | 1,2 | 3~100 | 160 | 270 | 550 | 1,050 | 1,740 | 3,350 | 5,420 |
| Operating Temp. | °C | 1,2 | 3~100 | -10°C~ 90°C | | | | | | |
| Degree of Gearbox Protection | | 1,2 | 3~100 | IP65 | | | | | | |
| Lubrication | | 1,2 | 3~100 | Synthetic lubrication grease | | | | | | |
| Mounting Position | | 1,2 | 3~100 | All directions | | | | | | |
| Running Noise[5] | dB(A) | 1 | 3~10 | ≦ 58 | ≦ 59 | ≦ 64 | ≦ 65 | ≦ 66 | ≦ 66 | ≦ 66 |
| | | 2 | 16~100 | ≦ 58 | ≦ 59 | ≦ 60 | ≦ 63 | ≦ 66 | ≦ 66 | ≦ 66 |
| Efficiency $\eta$ | % | 1 | 3~10 | ≧ 97% | | | | | | |
| | | 2 | 16~100 | ≧ 94% | | | | | | |

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

(2) These values are measured by gearbox with ratio 10 (1-stage) or ratio 100 (2-stage) at 3,000 rpm no loading.

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

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

(5) 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.

# Inertia - AFH Gearbox

| Model No. | | AFH 060 | | AFH 075 | | AFH 100 | | AFH 140 | |
|---|---|---|---|---|---|---|---|---|---|
| (C3) Ø (A) | Stage | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| 8 | | – | 0.1 | – | – | – | – | – | – |
| 11 | | 0.21 | 0.16 | – | 0.17 | – | – | – | – |
| 14 | | 0.24 | 0.2 | 0.54 | 0.21 | – | 0.42 | – | – |
| 19 | | 0.64 | – | 0.79 | 0.6 | 2.51 | 0.66 | – | 1.83 |
| 24 | | – | – | 4.06 | – | 4.78 | 3.94 | 6.85 | 4.11 |
| 28 | kg.cm² | – | – | – | – | 6.15 | – | 8.38 | 5.48 |
| 32 | | – | – | – | – | 8.03 | – | 10.41 | 7.36 |
| 35 | | – | – | – | – | 14.72 | – | 15.56 | 14.04 |
| 38 | | – | – | – | – | 17.38 | – | 20.43 | 16.71 |
| 42 | | – | – | – | – | – | – | 25.44 | – |
| 48 | | – | – | – | – | – | – | 54.66 | – |
| 55 | | – | – | – | – | – | – | – | – |
| 60 | | – | – | – | – | – | – | – | – |

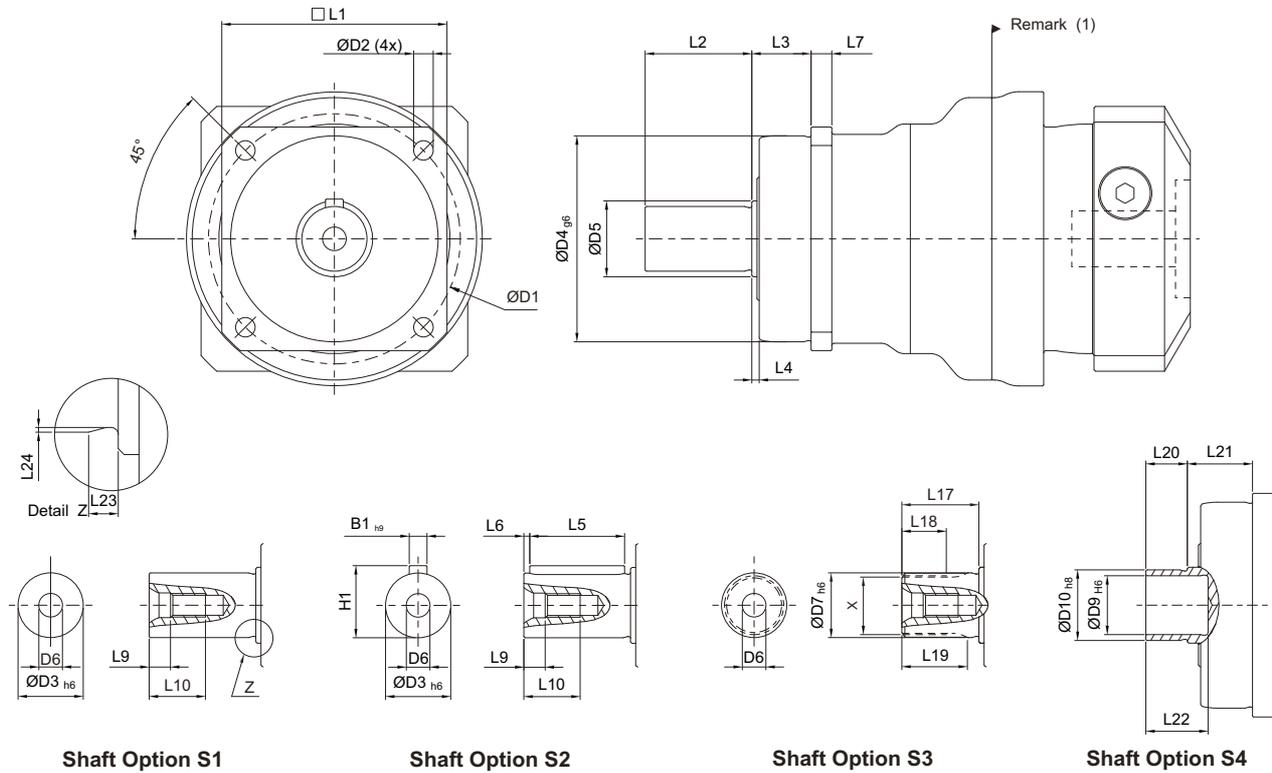| Model No. | | AFH 180 | | AFH 210 | | AFH 240 | |
|---|---|---|---|---|---|---|---|
| (C3) Ø (A) | Stage | 1 | 2 | 1 | 2 | 1 | 2 |
| 8 | | – | – | – | – | – | – |
| 11 | | – | – | – | – | – | – |
| 14 | | – | – | – | – | – | – |
| 19 | | – | – | – | – | – | – |
| 24 | | – | 4.61 | – | – | – | – |
| 28 | kg.cm² | – | 6.14 | – | – | – | – |
| 32 | | 19.5 | 8.17 | – | 10.55 | – | – |
| 35 | | 26.71 | 15.54 | 39.6 | 17.75 | 86.48 | 20.8 |
| 38 | | 29.11 | 18.19 | 42.43 | 20.17 | 86.48 | 23.66 |
| 42 | | 34.35 | 23.20 | 47.65 | 25.4 | 92.61 | 28.88 |
| 48 | | 64.13 | 52.42 | 77.41 | 55.18 | 122.26 | 58.64 |
| 55 | | 97.45 | – | 111.26 | – | 156.7 | 92.48 |
| 60 | | – | – | – | – | 180.17 | – |

(A) Ø = Input shaft diameter.
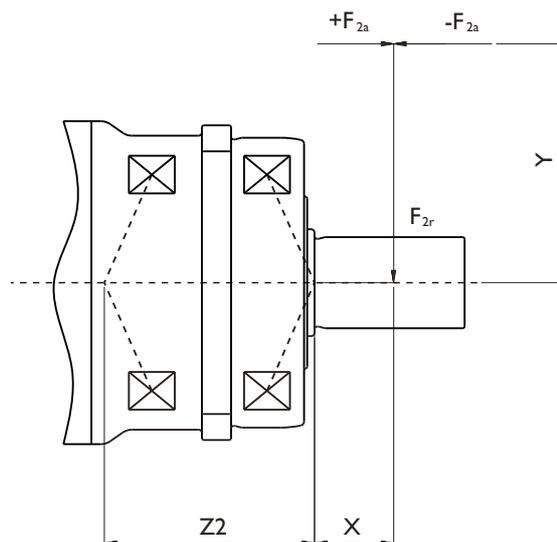


$$\text{Max. Tilting Moment } M_{2K} = \frac{F_{2a} * Y + F_{2r} * (X+Z2)}{1000}$$

$M_{2K}$ : 【Nm】
$F_{2a}, F_{2r}$ : 【N】
X, Y, Z2 : 【mm】

| AFH / AFHK | 060 | 075 | 100 | 140 | 180 | 210 | 240 |
|---|---|---|---|---|---|---|---|
| Z2【mm】 | 41.3 | 50.1 | 58.9 | 72.7 | 93.7 | 98.5 | 112.2 |

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

# Dimension - AFH Gearbox



**Shaft Option S1**  **Shaft Option S2**  **Shaft Option S3**  **Shaft Option S4**

| Dimension | | AFH 060 | AFH 075 | AFH 100 | AFH 140 | AFH 180 | AFH 210 | AFH 240 |
|---|---|---|---|---|---|---|---|---|
| D1 | | 68 | 85 | 120 | 165 | 215 | 250 | 290 |
| D2 | | 5.5 | 7 | 9 | 11 | 13.5 | 17 | 17 |
| D3 | h6 | 16 | 22 | 32 | 40 | 55 | 75 | 85 |
| D4 | g6 | 60 | 70 | 90 | 130 | 160 | 180 | 200 |
| D5 | | 18.5 | 25.8 | 36.8 | 55.2 | 69.2 | 82.2 | 92.2 |
| D6 | | M5 x 0.8P | M8 x 1.25P | M12 x 1.75P | M16 x 2P | M20 x 2.5P | M20 x 2.5P | M20 x 2.5P |
| D7 | h6 | 16 | 22 | 32 | 40 | 55 | 75 | 85 |
| D9 | H6 | 15 | 20 | 30 | 40 | 55 | - | - |
| D10 | h8 | 18 | 24 | 36 | 50 | 68 | - | - |
| L1 | | 62 | 76 | 101 | 141 | 182 | 215 | 245 |
| L2 | | 28 | 36 | 58 | 82 | 82 | 105 | 130 |
| L3 | | 20 | 20 | 30 | 30 | 30 | 38 | 40 |
| L4 | | 2 | 2.5 | 3 | 3 | 3 | 3 | 3 |
| L5 | | 25 | 32 | 50 | 63 | 70 | 90 | 125 |
| L6 | | 2 | 2 | 4 | 5 | 6 | 7 | 3 |
| L7 | | 6 | 7 | 10 | 12 | 15 | 17 | 22 |
| L9 | | 4.8 | 7.2 | 10 | 12 | 15 | 15 | 15 |
| L10 | | 12.5 | 19 | 28 | 36 | 42 | 42 | 42 |
| L17 | | 26 | 26 | 26 | 40 | 41.5 | 52 | 60 |
| L18 | | 15 | 15 | 15 | 20 | 21.5 | 28 | 36 |
| L19 | | 21 | 22.5 | 23 | 33.5 | 33.5 | 45 | 53 |
| L20 | | 12 | 14 | 18 | 22 | 23 | - | - |
| L21 | | 22 | 22 | 32 | 33 | 32 | - | - |
| L22 | | 19 | 21 | 25 | 30 | 30 | - | - |
| L23 | | 2 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 4 |
| L24 | | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.5 |
| B1 | h9 | 5 | 6 | 10 | 12 | 16 | 20 | 22 |
| H1 | | 18 | 24.5 | 35 | 43 | 59 | 79.5 | 90 |
| X DIN5480 | | W16 x 0.8 x 30 x 18 x 6m | W22x 1.25 x 30 x 16 x 6m | W32 x 1.25 x 30 x 24 x 6m | W40 x 2 x 30 x 18 x 6m | W55 x 2 x 30 x 26 x 6m | W70 x 2 x 30 x 34 x 6m | W80 x 2 x 30 x 38 x 6m |

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

# Shrink Disc Power Lock
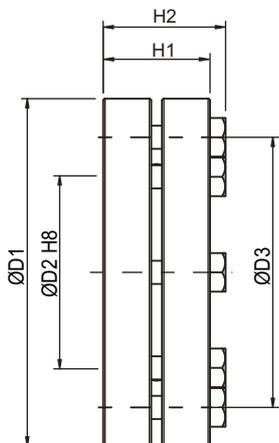


**SHRINK DISC POWER LOCK**

| Diameter | Tolerance |
|---|---|
| $\leqq 30$ | H6 / j6 |
| $> 30 \sim 50$ | H6 / h6 |
| $> 50 \sim 80$ | H6 / g6 |

* For surface roughness Ra $\leqq$ 3.2 um

| Model No. AFH / AFHK | D1 | D2 | D3 | H1 | H2 | Screw[1] No x type | TA[2] [Nm] | J [Kg.cm²] | Order code |
|---|---|---|---|---|---|---|---|---|---|
| 060 | 44 | 18 | 30 | 15 | 18.5 | 5 x M5 | 4 | 0.4 | SSD-18 |
| 075 | 50 | 24 | 36 | 19.5 | 23 | 6 x M5 | 4 | 0.8 | SSD-24 |
| 100 | 72 | 36 | 52 | 23.5 | 27.5 | 5 x M6 | 12 | 3.9 | SSD-36 |
| 140 | 90 | 50 | 70 | 27.5 | 31.5 | 8 x M6 | 12 | 11.2 | SSD-50 |
| 180 | 115 | 68 | 86 | 30.5 | 34.5 | 10 x M6 | 12 | 30.9 | SSD-68 |

(1) 10.9 Class, DIN 931  (2) Tightening Torque

# AFHK Gearbox Structure

**(I)** AFH / AFHK 2 Stage

**(II)** AFHKA 3 Stage

**(III)** AFHKB 3 Stage

**(IV)** AFHK 4 Stage
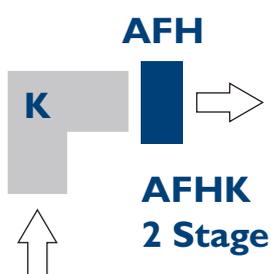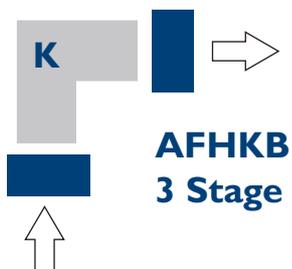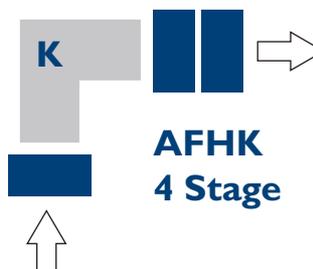
# Performance - AFHK (2-Stage) Gearbox

| Model No. | | Stage | Ratio[1] | AFHK 060 | AFHK 075 | AFHK 100 | AFHK 140 | AFHK 180 | AFHK 210 | AFHK 240 |
|---|---|---|---|---|---|---|---|---|---|---|
| Nominal Output Torque $T_{2N}$ | Nm | 2 | 12 | 95 | 195 | 360 | 615 | 1,315 | 1,680 | 3,280 |
| | | | 16 | 95 | 200 | 360 | 615 | 1,320 | 1,680 | 3,280 |
| | | | 20 | 95 | 200 | 360 | 615 | 1,320 | 1,775 | 3,335 |
| | | | 25 | 80 | 170 | 310 | 535 | 1,165 | 1,775 | 3,335 |
| | | | 28 | 92 | 200 | 360 | 615 | 1,325 | 1,560 | 3,000 |
| | | | 35 | 80 | 170 | 310 | 535 | 1,170 | 1,775 | 3,340 |
| | | | 40 | 60 | 160 | 340 | 615 | 1,325 | 1,440 | 2,400 |
| | | | 50 | 50 | 170 | 310 | 535 | 1,170 | 1,775 | 3,000 |
| | | | 70 | 60 | 130 | 250 | 440 | 990 | 1,510 | 2,550 |
| | | | 100 | 24 | 55 | 160 | 290 | 655 | 1,005 | 1,685 |
| 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[2] | Nm | 2 | 12~100 | 1 | 1.3 | 2 | 3.1 | 6 | 13 | 16 |
| Backlash[3] | arcmin | 2 | 12~100 | ≦ 3 | ≦ 2 | ≦ 2 | ≦ 2 | ≦ 2 | ≦ 2 | ≦ 2 |
| Torsional Rigidity | Nm/arcmin | 2 | 12~100 | 4.6 | 10 | 30 | 55 | 175 | 300 | 510 |
| Nominal Input Speed $n_{1N}$ | rpm | 2 | 12~100 | 3,000 | 3,000 | 2,800 | 2,700 | 2,200 | 2,100 | 2,000 |
| Max. Input Speed $n_{1B}$ | rpm | 2 | 12~100 | 6,000 | 6,000 | 6,000 | 4,500 | 4,500 | 4,000 | 3,000 |
| Max. Radial Load $F_{r}$[4] | N | 2 | 12~100 | 3,000 | 4,500 | 6,700 | 10,000 | 15,000 | 22,000 | 30,000 |
| Max. Axial Load $F_{2a}$[4] | N | 2 | 12~100 | 1,500 | 2,250 | 3,350 | 5,000 | 7,500 | 11,000 | 15,000 |
| Max. Tilting Moment $M_{2K}$[4] | Nm | 2 | 12~100 | 160 | 270 | 550 | 1,050 | 1,740 | 3,350 | 5,420 |
| 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[5] | dB(A) | 2 | 12~100 | ≦ 64 | ≦ 66 | ≦ 68 | ≦ 68 | ≦ 70 | ≦ 70 | ≦ 72 |
| Efficiency η | % | 2 | 12~100 | ≧ 94% | | | | | | |

(1) Ratio ( $i = N_{in} / N_{out}$ ) .
(2) These values are measured by gearbox with ratio 100 (2-stage) at 3,000 rpm no loading.
(3) Backlash is measured at 2% of Nominal Output Torque $T_{2N}$.
(4) Applied to the output shaft center at 100 rpm.
(5) The dB values are measured by gearbox with 100 (2-stage), no loading at 3,000 RPM or at the respective Nominal Input Speed by bigger model size.
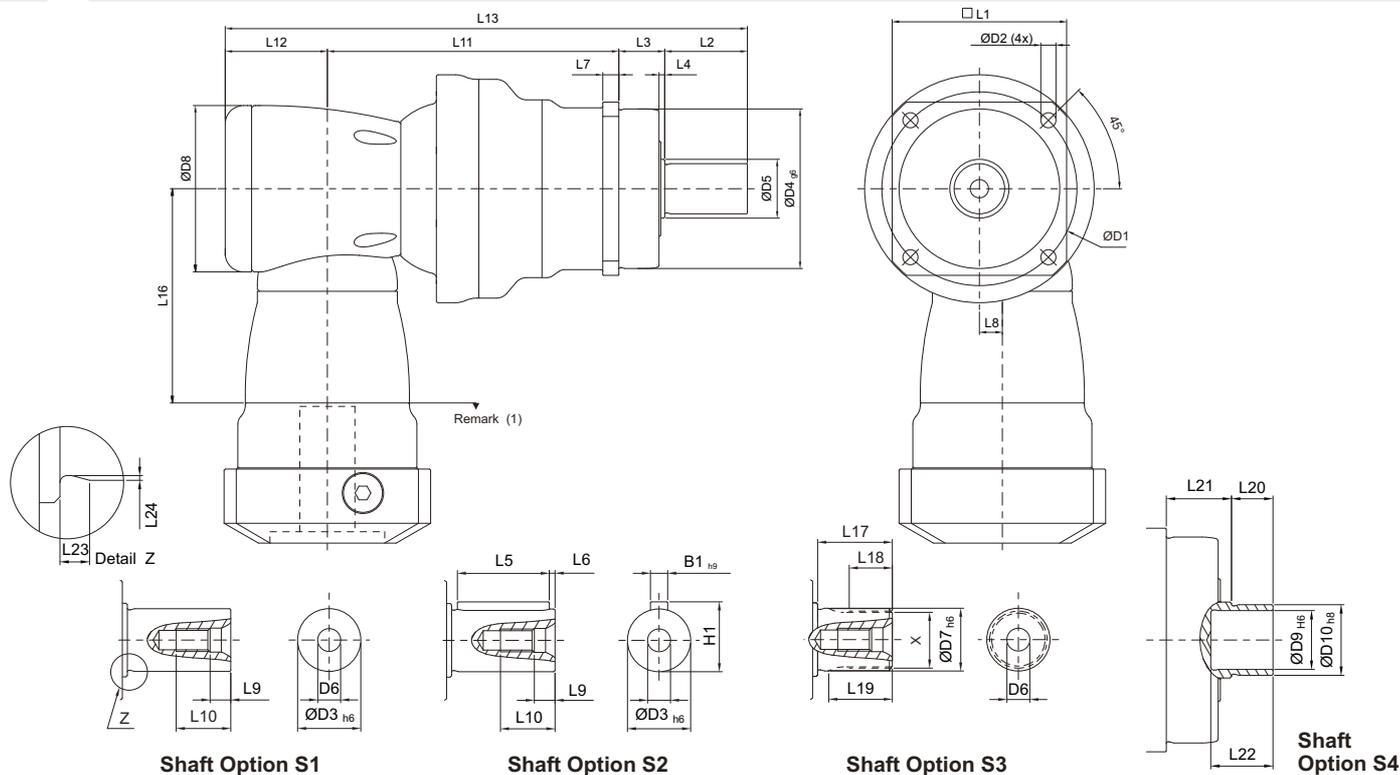 By lower ratio and/or higher RPM, the noise level could be 3 to 5 dB higher.

# Inertia - AFHK (2-Stage) Gearbox

| (C3) Ø [A] | Model No. | AFHK 060 | AFHK 075 | AFHK 100 | AFHK 140 | AFHK 180 | AFHK 210 | AFHK 240 |
|---|---|---|---|---|---|---|---|---|
| 8 | kg.cm² | 0.1 | – | – | – | – | – | – |
| 11 | | 0.16 | 0.17 | – | – | – | – | – |
| 14 | | 0.2 | 0.37 | 0.41 | – | – | – | – |
| 19 | | – | 0.6 | 1.61 | 1.61 | – | – | – |
| 24 | | – | – | 3.9 | 4.01 | 5.62 | – | – |
| 28 | | – | – | – | 5.53 | 5.62 | – | – |
| 32 | | – | – | – | 7.57 | 8.11 | 8.11 | – |
| 35 | | – | – | – | 14.95 | 15.32 | 15.32 | 15.68 |
| 38 | | – | – | – | 17.58 | 17.72 | 17.72 | 18.52 |
| 42 | | – | – | – | – | 22.95 | 22.95 | 23.74 |
| 48 | | – | – | – | – | 52.74 | 52.74 | 53.49 |
| 55 | | – | – | – | – | – | – | 87.34 |

(A) Ø = Input shaft diameter.

# Dimension - AFHK (2-Stage) Gearbox (Ratio i = 12~100)



**Shaft Option S1**

**Shaft Option S2**

**Shaft Option S3**

**Shaft Option S4**

| Dimension | | AFHK 060 | AFHK 075 | AFHK 100 | AFHK 140 | AFHK 180 | AFHK 210 | AFHK 240 |
|---|---|---|---|---|---|---|---|---|
| D1 | | 68 | 85 | 120 | 165 | 215 | 250 | 290 |
| D2 | | 5.5 | 7 | 9 | 11 | 13.5 | 17 | 17 |
| D3 | h6 | 16 | 22 | 32 | 40 | 55 | 75 | 85 |
| D4 | g6 | 60 | 70 | 90 | 130 | 160 | 180 | 200 |
| D5 | | 18.5 | 25.8 | 36.8 | 55.2 | 69.2 | 82.2 | 92.2 |
| D6 | | M5 x 0.8P | M8 x 1.25P | M12 x 1.75P | M16 x 2P | M20 x 2.5P | M20 x 2.5P | M20 x 2.5P |
| D7 | h6 | 16 | 22 | 32 | 40 | 55 | 75 | 85 |
| D8 | | 73 | 94 | 116 | 163 | 210 | 210 | 255 |
| D9 | H6 | 15 | 20 | 30 | 40 | 55 | - | - |
| D10 | h8 | 18 | 24 | 36 | 50 | 68 | - | - |
| L1 | | 62 | 76 | 101 | 141 | 182 | 215 | 245 |
| L2 | | 28 | 36 | 58 | 82 | 82 | 105 | 130 |
| L3 | | 20 | 20 | 30 | 30 | 30 | 38 | 40 |
| L4 | | 2 | 2.5 | 3 | 3 | 3 | 3 | 3 |
| L5 | | 25 | 32 | 50 | 63 | 70 | 90 | 125 |
| L6 | | 2 | 2 | 4 | 5 | 6 | 7 | 3 |
| L7 | | 6 | 7 | 10 | 12 | 15 | 17 | 22 |
| L8 | | 10 | 13 | 17 | 25 | 31 | 31 | 36 |
| L9 | | 4.8 | 7.2 | 10 | 12 | 15 | 15 | 15 |
| L10 | | 12.5 | 19 | 28 | 36 | 42 | 42 | 42 |
| L11 | | 118.5 | 135.5 | 152.5 | 191 | 248 | 270 | 336 |
| L12 | | 44.5 | 53 | 68.3 | 89 | 115 | 115 | 131 |
| L13 | | 211 | 244.5 | 308.8 | 392 | 475 | 528 | 637 |
| L16 | | 94 | 114.5 | 129 | 173.5 | 228 | 228 | 265.5 |
| L17 | | 26 | 26 | 26 | 40 | 41.5 | 52 | 60 |
| L18 | | 15 | 15 | 15 | 20 | 21.5 | 28 | 36 |
| L19 | | 21 | 22.5 | 23 | 33.5 | 33.5 | 45 | 53 |
| L20 | | 12 | 14 | 18 | 22 | 23 | - | - |
| L21 | | 22 | 22 | 32 | 33 | 32 | - | - |
| L22 | | 19 | 21 | 25 | 30 | 30 | - | - |
| L23 | | 2 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 4 |
| L24 | | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.5 |
| B1 | h9 | 5 | 6 | 10 | 12 | 16 | 20 | 22 |
| H1 | | 18 | 24.5 | 35 | 43 | 59 | 79.5 | 90 |
| X DIN5480 | | W16 x 0.8 x 30 x 18 x 6m | W22 x 1.25 x 30 x 16 x 6m | W32 x 1.25 x 30 x 24 x 6m | W40 x 2 x 30 x 18 x 6m | W55 x 2 x 30 x 26 x 6m | W70 x 2 x 30 x 34 x 6m | W80 x 2 x 30 x 38 x 6m |

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

# Performance - AFHKA (3-Stage) Gearbox

| Model No. | | Stage | Ratio[1] | AFHKA 240 |
|---|---|---|---|---|
| Nominal Output Torque $T_{2N}$ | Nm | 3 | 100 | 3,800 |
| | | | 125 | 3,345 |
| | | | 140 | 3,800 |
| | | | 175 | 3,345 |
| | | | 200 | 3,800 |
| | | | 250 | 3,345 |
| | | | 350 | 3,345 |
| | | | 500 | 3,345 |
| | | | 700 | 2,555 |
| | | | 1,000 | 1,650 |
| 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[2] | Nm | 3 | 100~1,000 | 6 |
| Backlash[3] | arcmin | 3 | 100~1,000 | ≦ 2 |
| Torsional Rigidity | Nm/arcmin | 3 | 100~1,000 | 510 |
| Nominal Input Speed $n_{1N}$ | rpm | 3 | 100~1,000 | 2,100 |
| Max. Input Speed $n_{1B}$ | rpm | 3 | 100~1,000 | 4,000 |
| Max. Radial Load $F_r$[4] | N | 3 | 100~1,000 | 30,000 |
| Max. Axial Load $F_{2a}$[4] | N | 3 | 100~1,000 | 15,000 |
| Max. Tilting Moment $M_{2K}$[4] | Nm | 3 | 100~1,000 | 5,420 |
| 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[5] | dB(A) | 3 | 100~1,000 | ≦ 72 |
| Efficiency η | % | 3 | 100~1,000 | ≧ 92% |

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

(2) These values are measured by gearbox with ratio 1,000 (3-stage) at 3,000 rpm no loading.

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

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

(5) The dB values are measured by gearbox with 1,000 (3-stage), no loading at 3,000 RPM or at the respective Nominal Input Speed by bigger model size.
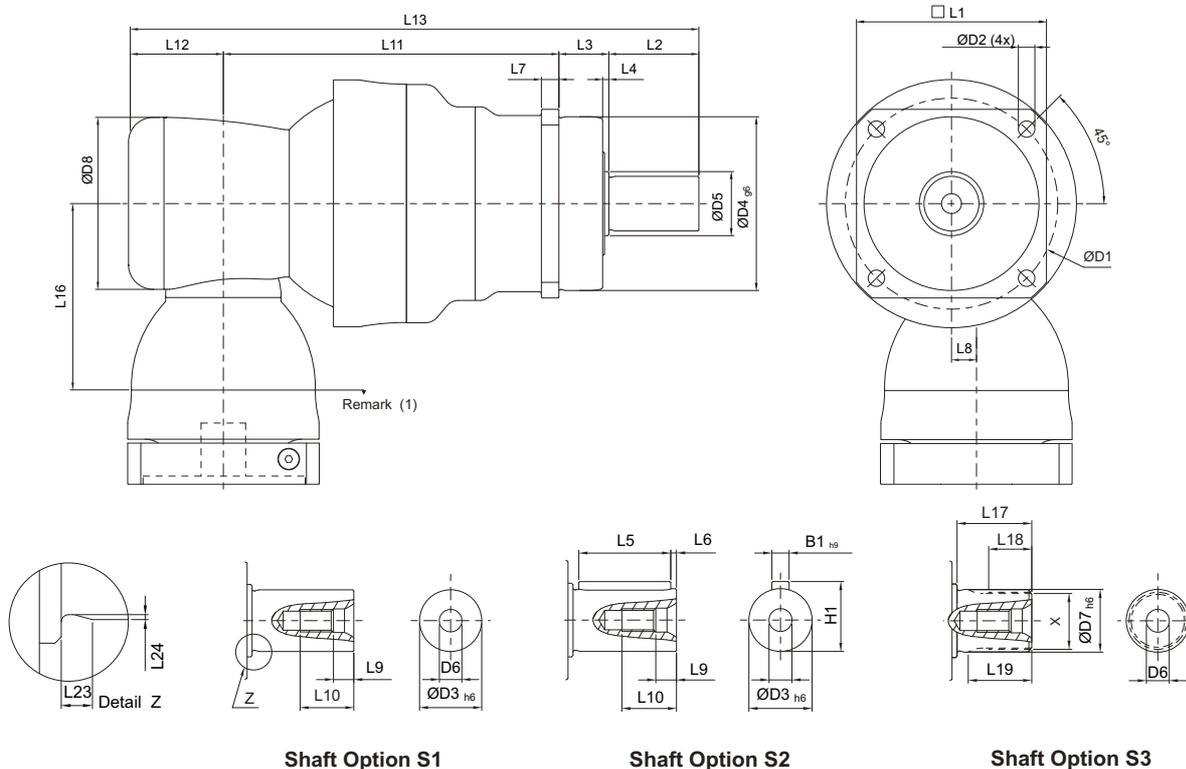    By lower ratio and/or higher RPM, the noise level could be 3 to 5 dB higher.

# Inertia - AFHKA (3-Stage) Gearbox

| Model No. (C3) Ø[A] | | AFHKA 240 |
|---|---|---|
| 32 | kg.cm$^2$ | 8.11 |
| 35 | | 15.32 |
| 38 | | 17.72 |
| 42 | | 22.95 |
| 48 | | 52.74 |

(A) Ø = Input shaft diameter.

# Dimension - AFHKA (3-Stage) Gearbox (Ratio i = 100~1,000)



**Shaft Option S1**

**Shaft Option S2**

**Shaft Option S3**

| Dimension | | AFHKA 240 |
|---|---|---|
| D1 | | 290 |
| D2 | | 17 |
| D3 | h6 | 85 |
| D4 | g6 | 200 |
| D5 | | 92.2 |
| D6 | | M20 x 2.5P |
| D7 | h6 | 85 |
| D8 | | 210 |
| L1 | | 245 |
| L2 | | 130 |
| L3 | | 40 |
| L4 | | 3 |
| L5 | | 125 |
| L6 | | 3 |
| L7 | | 22 |
| L8 | | 31 |
| L9 | | 15 |
| L10 | | 42 |
| L11 | | 378 |
| L12 | | 115 |
| L13 | | 663 |
| **L16** | | 228 |
| L17 | | 60 |
| L18 | | 36 |
| L19 | | 53 |
| L23 | | 4 |
| L24 | | 0.5 |
| B1 | h9 | 22 |
| H1 | | 90 |
| X DIN5480 | | W80 x 2 x 30 x 38 x 6m |

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

# Performance - AFHKB (3-Stage) Gearbox

| Model No. | | Stage | Ratio[1] | AFHKB 075 | AFHKB 100 | AFHKB 140 | AFHKB 180 | AFHKB 210 | AFHKB 240 |
|---|---|---|---|---|---|---|---|---|---|
| Nominal Output Torque $T_{2N}$ | Nm | 3 | 48 | – | – | – | – | – | 3,280 |
| | | | 64 | 200 | 360 | 615 | 1,325 | 1,680 | 3,280 |
| | | | 84 | 200 | 360 | 620 | 1,325 | 1,680 | – |
| | | | 100 | 200 | 360 | 620 | 1,330 | 1,780 | 3,345 |
| | | | 125 | 170 | 310 | 535 | 1,170 | 1,780 | 3,345 |
| | | | 140 | 200 | 360 | 620 | 1,330 | 1,780 | 3,345 |
| | | | 175 | 170 | 310 | 535 | 1,170 | 1,780 | 3,345 |
| | | | 200 | 200 | 360 | 620 | 1,330 | 1,780 | 3,345 |
| | | | 250 | 170 | 310 | 535 | 1,170 | 1,780 | 3,345 |
| | | | 280 | 200 | 360 | 620 | 1,330 | 1,510 | 3,000 |
| | | | 350 | 170 | 310 | 535 | 1,170 | 1,775 | 3,345 |
| | | | 400 | 160 | 340 | 620 | 1,330 | 1,440 | 2,400 |
| | | | 500 | 170 | 310 | 535 | 1,170 | 1,780 | 3,000 |
| | | | 700 | 130 | 250 | 440 | 990 | 1,510 | 2,555 |
| | | | 1,000 | 55 | 160 | 290 | 640 | 980 | 1,655 |
| Emergency Stop Torque $T_{2NOT}$ | Nm | 3 | 48~1,000 | 2 times $T_{2N}$ |
| Max. Acceleration Torque $T_{2B}$ | Nm | 3 | 48~1,000 | 1.5 times $T_{2N}$ |
| No Load Running Torque[2] | Nm | 3 | 48~1,000 | 0.2 | 0.2 | 0.3 | 0.4 | 1 | 1.2 |
| Backlash[3] | arcmin | 3 | 48~1,000 | ≦ 2 | ≦ 2 | ≦ 2 | ≦ 2 | ≦ 2 | ≦ 2 |
| Torsional Rigidity | Nm/arcmin | 3 | 48~1,000 | 10 | 30 | 55 | 175 | 300 | 510 |
| Nominal Input Speed $n_{IN}$ | rpm | 3 | 48~1,000 | 5,500 | 4,600 | 4,600 | 4,000 | 3,700 | 3,400 |
| Max. Input Speed $n_{IB}$ | rpm | 3 | 48~1,000 | 7,000 | 7,000 | 7,000 | 6,000 | 5,500 | 5,000 |
| Max. Radial Load $F_r^{(4)}$ | N | 3 | 48~1,000 | 4,500 | 6,700 | 10,000 | 15,000 | 22,000 | 30,000 |
| Max. Axial Load $F_{2a}^{(4)}$ | N | 3 | 48~1,000 | 2,250 | 3,350 | 5,000 | 7,500 | 11,000 | 15,000 |
| Max. Tilting Moment $M_{2K}^{(4)}$ | Nm | 3 | 48~1,000 | 270 | 550 | 1,050 | 1,740 | 3,350 | 5,420 |
| Operating Temp. | ° C | 3 | 48~1,000 | -10° C~ 90° C |
| Degree of Gearbox Protection | | 3 | 48~1,000 | IP65 |
| Lubrication | | 3 | 48~1,000 | Synthetic lubrication grease |
| Mounting Position | | 3 | 48~1,000 | All directions |
| Running Noise[5] | dB(A) | 3 | 48~1,000 | ≦ 66 | ≦ 68 | ≦ 68 | ≦ 70 | ≦ 70 | ≦ 72 |
| Efficiency η | % | 3 | 48~1,000 | ≧ 92% |

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

(2) These values are measured by gearbox with ratio 1,000 (3-stage) at 3,000 rpm no loading.

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

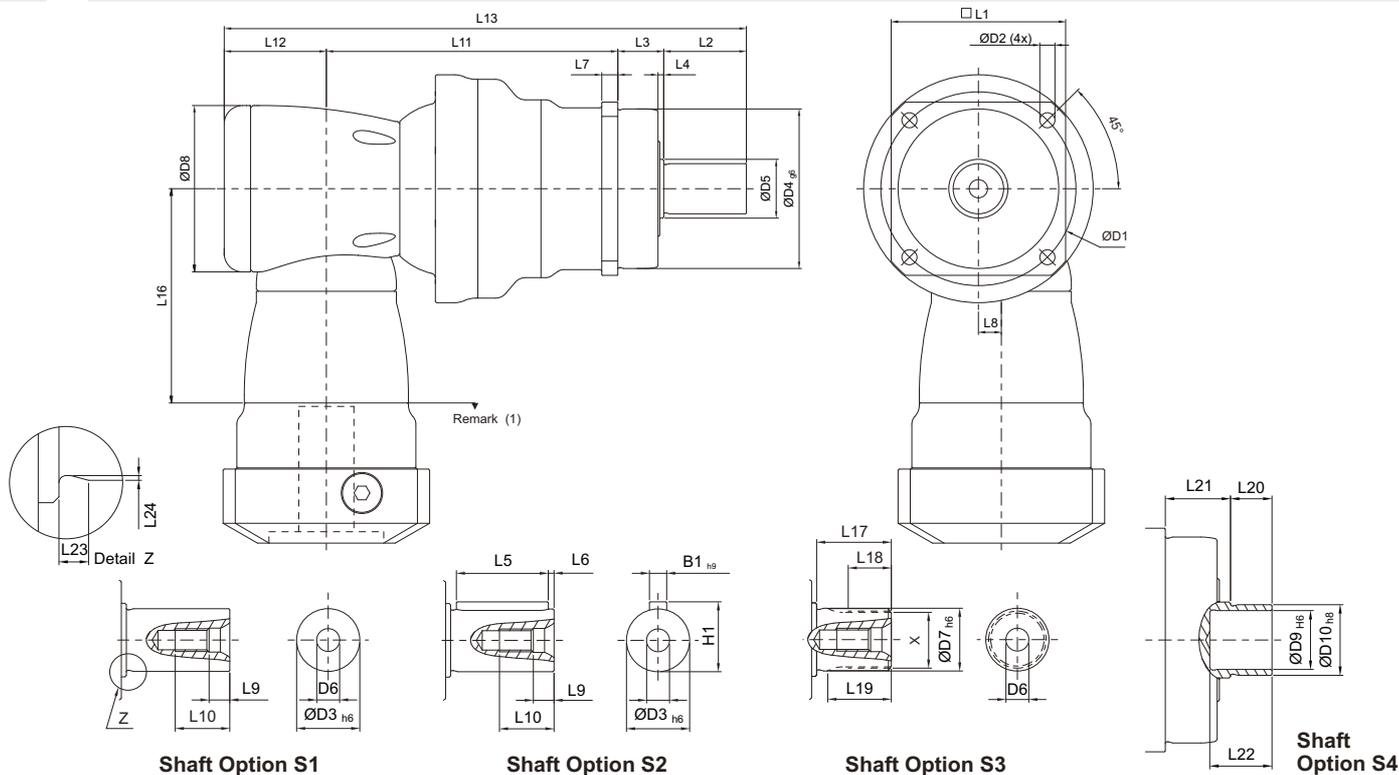(4) Applied to the output shaft center at 100 rpm.

(5) The dB values are measured by gearbox with 1,000 (3-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.

# Inertia - AFHKB (3-Stage) Gearbox

| Model No. (C3) Ø[A] | | AFHKB 075 | AFHKB 100 | AFHKB 140 | AFHKB 180 | AFHKB 210 | AFHKB 240 |
|---|---|---|---|---|---|---|---|
| 8 | | 0.17 | – | – | – | – | – |
| 11 | | 0.17 | 0.42 | – | – | – | – |
| 14 | | 0.21 | 0.42 | 1.83 | – | – | – |
| 19 | | – | 0.66 | 1.83 | 4.61 | – | – |
| 24 | | – | – | 4.11 | 4.61 | 4.61 | – |
| 28 | kg.cm² | – | – | – | 6.14 | 6.14 | – |
| 32 | | – | – | – | 8.17 | 8.17 | 10.55 |
| 35 | | – | – | – | 15.56 | 15.56 | 17.76 |
| 38 | | – | – | – | 18.19 | 18.19 | 20.17 |
| 42 | | – | – | – | – | 23.2 | 25.4 |
| 48 | | – | – | – | – | 52.42 | 55.18 |

(A) Ø = Input shaft diameter.

# Dimension - AFHKB (3-Stage) Gearbox (Ratio i = 48~1,000)



**Shaft Option S1**

**Shaft Option S2**

**Shaft Option S3**

**Shaft Option S4**

Remark (1)

Detail Z

| Dimension | | AFHKB 075 | AFHKB 100 | AFHKB 140 | AFHKB 180 | AFHKB 210 | AFHKB 240 |
|---|---|---|---|---|---|---|---|
| D1 | | 85 | 120 | 165 | 215 | 250 | 290 |
| D2 | | 7 | 9 | 11 | 13.5 | 17 | 17 |
| D3 | h6 | 22 | 32 | 40 | 55 | 75 | 85 |
| D4 | g6 | 70 | 90 | 130 | 160 | 180 | 200 |
| D5 | | 25.8 | 36.8 | 55.2 | 69.2 | 82.2 | 92.2 |
| D6 | | M8 x 1.25P | M12 x 1.75P | M16 x 2P | M20 x 2.5P | M20 x 2.5P | M20 x 2.5P |
| D7 | h6 | 22 | 32 | 40 | 55 | 75 | 85 |
| D8 | | 94 | 116 | 163 | 210 | 210 | 255 |
| D9 | H6 | 20 | 30 | 40 | 55 | - | - |
| D10 | h8 | 24 | 36 | 50 | 68 | - | - |
| L1 | | 76 | 101 | 141 | 182 | 215 | 245 |
| L2 | | 36 | 58 | 82 | 82 | 105 | 130 |
| L3 | | 20 | 30 | 30 | 30 | 38 | 40 |
| L4 | | 2.5 | 3 | 3 | 3 | 3 | 3 |
| L5 | | 32 | 50 | 63 | 70 | 90 | 125 |
| L6 | | 2 | 4 | 5 | 6 | 7 | 3 |
| L7 | | 7 | 10 | 12 | 15 | 17 | 22 |
| L8 | | 13 | 17 | 25 | 31 | 31 | 36 |
| L9 | | 7.2 | 10 | 12 | 15 | 15 | 15 |
| L10 | | 19 | 28 | 36 | 42 | 42 | 42 |
| L11 | | 135.5 | 152.5 | 191 | 248 | 270 | 336 |
| L12 | | 53 | 68.3 | 89 | 115 | 115 | 131 |
| L13 | | 244.5 | 308.8 | 392 | 475 | 528 | 637 |
| **L16** | | 114.5 | 129 | 173.5 | 228 | 228 | 265.5 |
| L17 | | 26 | 26 | 40 | 41.5 | 52 | 60 |
| L18 | | 15 | 15 | 20 | 21.5 | 28 | 36 |
| L19 | | 22.5 | 23 | 33.5 | 33.5 | 45 | 53 |
| L20 | | 14 | 18 | 22 | 23 | - | - |
| L21 | | 22 | 32 | 33 | 32 | - | - |
| L22 | | 21 | 25 | 30 | 30 | - | - |
| L23 | | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 4 |
| L24 | | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.5 |
| B1 | h9 | 6 | 10 | 12 | 16 | 20 | 22 |
| H1 | | 24.5 | 35 | 43 | 59 | 79.5 | 90 |
| X DIN5480 | | W22 x 1.25 x 30 x 16 x 6m | W32 x 1.25 x 30 x 24 x 6m | W40 x 2 x 30 x 18 x 6m | W55 x 2 x 30 x 26 x 6m | W70 x 2 x 30 x 34 x 6m | W80 x 2 x 30 x 38 x 6m |

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

# Performance - AFHK (4-Stage) Gearbox

| Model No. | | Stage | Ratio [1] | AFHK 240 |
|---|---|---|---|---|
| Nominal Output Torque $T_{2N}$ | Nm | 4 | 1,225 | 3,350 |
| | | | 1,400 | 3,800 |
| | | | 1,750 | 3,350 |
| | | | 2,000 | 3,800 |
| | | | 2,800 | 2,555 |
| | | | 3,500 | 3,350 |
| | | | 5,000 | 3,350 |
| | | | 7,000 | 2,625 |
| | | | 10,000 | 1,975 |
| Emergency Stop Torque $T_{2NOT}$ | Nm | 4 | 1,225~10,000 | 2 times $T_{2N}$ |
| Max. Acceleration Torque $T_{2B}$ | Nm | 4 | 1,225~10,000 | 1.5 times $T_{2N}$ |
| No Load Running Torque[2] | Nm | 4 | 1,225~10,000 | 0.4 |
| Backlash[3] | arcmin | 4 | 1,225~10,000 | ≦ 2 |
| Torsional Rigidity | Nm/arcmin | 4 | 1,225~10,000 | 510 |
| Nominal Input Speed $n_{1N}$ | rpm | 4 | 1,225~10,000 | 3,700 |
| Max. Input Speed $n_{1B}$ | rpm | 4 | 1,225~10,000 | 5,500 |
| Max. Radial Load $F_{2r}$[4] | N | 4 | 1,225~10,000 | 30,000 |
| Max. Axial Load $F_{2a}$[4] | N | 4 | 1,225~10,000 | 15,000 |
| Max. Tilting Moment $M_{2K}$[4] | Nm | 4 | 1,225~10,000 | 5,420 |
| 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[5] | dB(A) | 4 | 1,225~10,000 | ≦ 72 |
| Efficiency $\eta$ | % | 4 | 1,225~10,000 | ≧ 90% |

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

(2) These values are measured by gearbox with ratio 10,000 (4-stage) at 3,000 rpm no loading.

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

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

(5) The dB values are measured by gearbox with 10,000 (4-stage), no loading at 3,000 RPM or at the respective Nominal Input Speed by bigger model size.
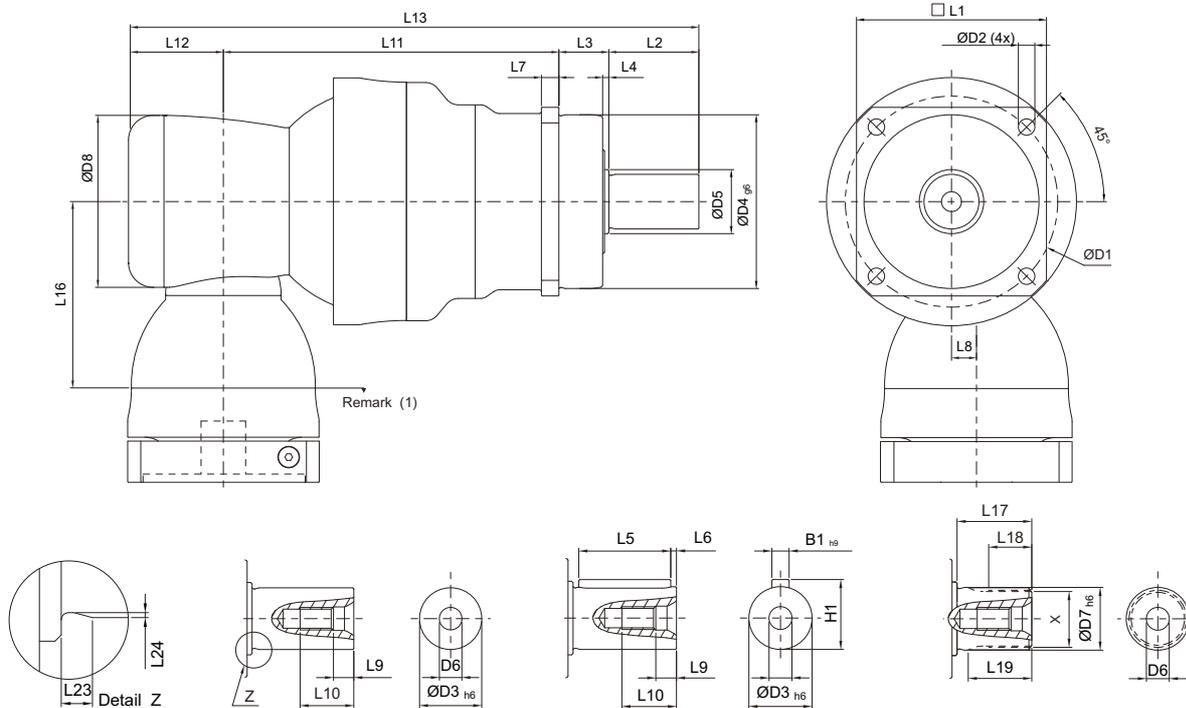   By lower ratio and/or higher RPM, the noise level could be 3 to 5 dB higher.

# Inertia - AFHK (4-Stage) Gearbox

| Model No. (C3) Ø [A] | | AFHK 240 |
|---|---|---|
| 24 | | 4.61 |
| 28 | | 6.14 |
| 32 | kg.cm$^2$ | 8.17 |
| 35 | | 15.56 |
| 38 | | 18.19 |

(A) Ø = Input shaft diameter.

# Dimension - AFHK (4-Stage) Gearbox (Ratio i = 1,225~10,000)

**Shaft Option S1**

**Shaft Option S2**

**Shaft Option S3**

| Dimension | | AFHK 240 |
|---|---|---|
| D1 | | 290 |
| D2 | | 17 |
| D3 | h6 | 85 |
| D4 | g6 | 200 |
| D5 | | 92.2 |
| D6 | | M20 x 2.5P |
| D7 | h6 | 85 |
| D8 | | 210 |
| L1 | | 245 |
| L2 | | 130 |
| L3 | | 40 |
| L4 | | 3 |
| L5 | | 125 |
| L6 | | 3 |
| L7 | | 22 |
| L8 | | 31 |
| L9 | | 15 |
| L10 | | 42 |
| L11 | | 378 |
| L12 | | 115 |
| L13 | | 663 |
| L16 | | 228 |
| L17 | | 60 |
| L18 | | 36 |
| L19 | | 53 |
| L23 | | 4 |
| L24 | | 0.5 |
| B1 | h9 | 22 |
| H1 | | 90 |
| X DIN5480 | | W80 x 2 x 30 x 38 x 6m |

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

# Performance - AFHKC Gearbox

| Model No. | Stage | Ratio[1] | AFHKC 060 | AFHKC 075 | AFHKC 100 | AFHKC 140 | AFHKC 180 | AFHKC 210 | AFHKC 240 |
|---|---|---|---|---|---|---|---|---|---|---|
| Nominal Output Torque $T_{2N}$ | Nm | 2 | 4 | 95 | 195 | 355 | 605 | 1,300 | 1,975 | 3,750 |
| | | | 5 | 80 | 165 | 305 | 525 | 1,150 | 1,755 | 3,305 |
| | | | 7 | 60 | 130 | 250 | 440 | 985 | 1,500 | 2,535 |
| | | | 8 | 95 | 195 | 360 | 610 | 1,315 | 1,995 | 3,785 |
| | | | 10 | 80 | 165 | 310 | 530 | 1,160 | 1,765 | 3,325 |
| Emergency Stop Torque $T_{2NOT}$ | Nm | 2 | 4~10 | 2 times $T_{2N}$ |
| Max. Acceleration Torque $T_{2B}$ | Nm | 2 | 4~10 | 1.5 times $T_{2N}$ | | | | | | |
| No Load Running Torque[2] | Nm | 2 | 4~10 | 2 | 2.5 | 5.8 | 12 | 25 | 48 | 95 |
| Backlash[3] | arcmin | 2 | 4~10 | ≦ 3 | ≦ 2 | ≦ 2 | ≦ 2 | ≦ 2 | ≦ 2 | ≦ 2 |
| Torsional Rigidity | Nm/arcmin | 2 | 4~10 | 4.6 | 10 | 30 | 55 | 175 | 300 | 510 |
| Nominal Input Speed $n_{IN}$ | rpm | 2 | 4~10 | 5,000 | 3,600 | 3,000 | 2,300 | 1,800 | 1,500 | 1,100 |
| Max. Input Speed $n_{1B}$ | rpm | 2 | 4~10 | 7,000 | 6,000 | 5,500 | 4,500 | 3,500 | 3,000 | 2,200 |
| Max. Radial Load $F_r$[4] | N | 2 | 4~10 | 3,000 | 4,500 | 6,700 | 10,000 | 15,000 | 22,000 | 30,000 |
| Max. Axial Load $F_{2a}$[4] | N | 2 | 4~10 | 1,500 | 2,250 | 3,350 | 5,000 | 7,500 | 11,000 | 15,000 |
| Max. Tilting Moment $M_{2K}$[4] | Nm | 2 | 4~10 | 160 | 270 | 550 | 1,050 | 1,740 | 3,350 | 5,420 |
| Operating Temp. | ° C | 2 | 4~10 | -10° C~ 90° C | | | | | | |
| Degree of Gearbox Protection | | 2 | 4~10 | IP65 | | | | | | |
| Lubrication | | 2 | 4~10 | Synthetic lubrication grease | | | | | | |
| Mounting Position | | 2 | 4~10 | All directions | | | | | | |
| Running Noise[5] | dB(A) | 2 | 4~10 | ≦ 68 | ≦ 68 | ≦ 68 | ≦ 70 | ≦ 70 | ≦ 72 | ≦ 74 |
| Efficiency η | % | 2 | 4~10 | ≧ 95 % | | | | | | |

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

(2) These values are measured by gearbox with ratio 10 (2-stage) at 3,000 rpm no loading.

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

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

(5) The dB values are measured by gearbox with 10 (2-stage), no loading at 3,000 RPM or at the respective Nominal Input Speed by bigger model size.
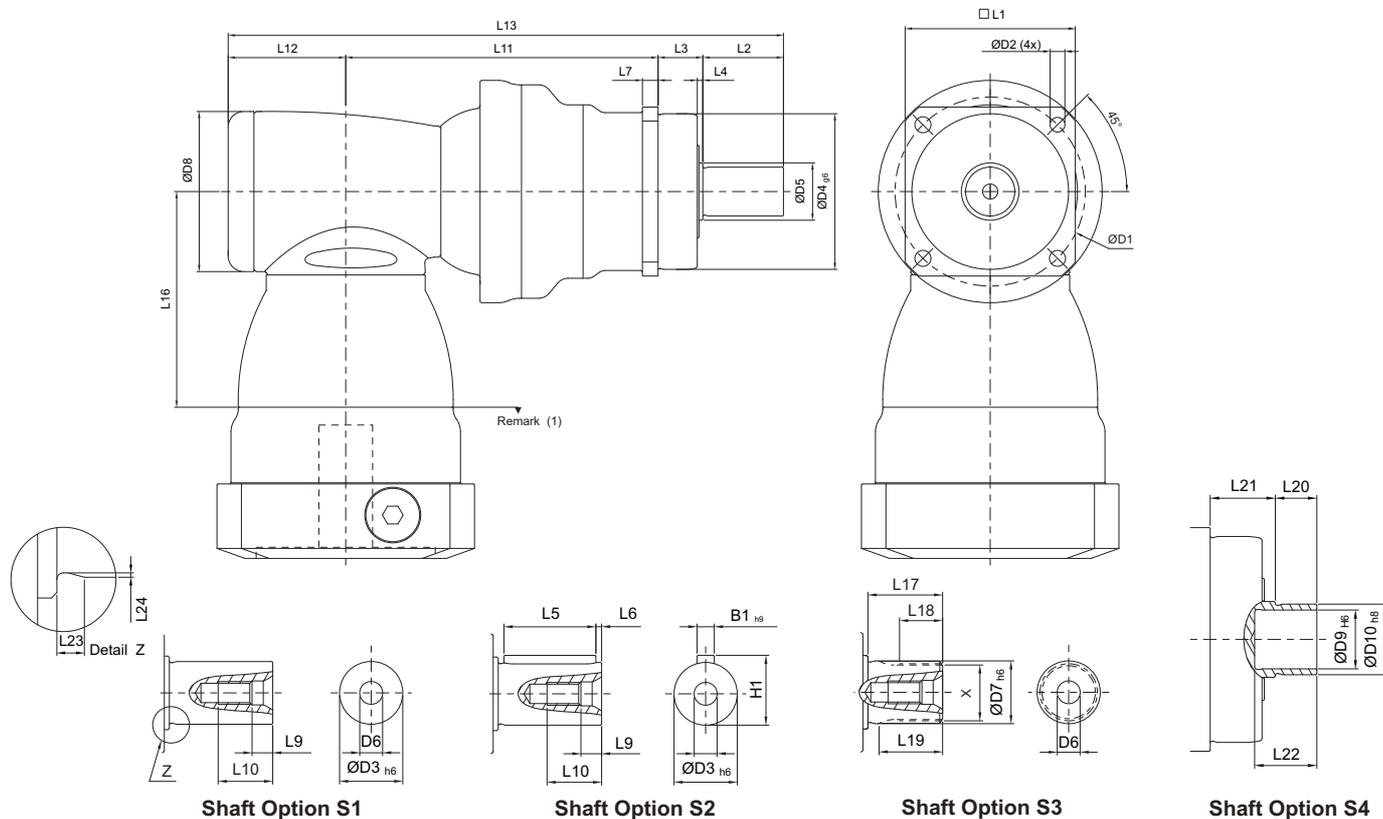
    By lower ratio and/or higher RPM, the noise level could be 3 to 5 dB higher.

# Inertia - AFHKC Gearbox

| (C3) Ø[A] | Model No. | AFHKC 060 | AFHKC 075 | AFHKC 100 | AFHKC 140 | AFHKC 180 | AFHKC 210 | AFHKC 240 |
|---|---|---|---|---|---|---|---|---|
| 8 | | 0.1 | – | – | – | – | – | – |
| 11 | | 0.16 | 0.41 | – | – | – | – | – |
| 14 | | 0.20 | 0.41 | – | – | – | – | – |
| 19 | | 0.58 | 1.61 | 1.61 | – | – | – | – |
| 24 | | – | 3.9 | 4.01 | 5.62 | – | – | – |
| 28 | kg.cm² | – | – | 5.53 | 5.62 | – | – | – |
| 32 | | – | – | 7.57 | 8.11 | 8.11 | – | – |
| 35 | | – | – | 14.95 | 15.32 | 15.32 | 15.68 | 19.37 |
| 38 | | – | – | 17.58 | 17.72 | 17.72 | 18.52 | 19.37 |
| 42 | | – | – | – | 22.95 | 22.95 | 23.74 | 25.5 |
| 48 | | – | – | – | 52.74 | 52.74 | 53.49 | 55.14 |
| 55 | | – | – | – | – | – | 87.34 | 89.59 |
| 60 | | – | – | – | – | – | – | 113.06 |

(A)  Ø = Input shaft diameter.

# Dimension - AFHKC Gearbox (Ratio i = 4~10)



**Shaft Option S1**

**Shaft Option S2**

**Shaft Option S3**

**Shaft Option S4**

| Dimension | | AFHKC 060 | AFHKC 075 | AFHKC 100 | AFHKC 140 | AFHKC 180 | AFHKC 210 | AFHKC 240 |
|---|---|---|---|---|---|---|---|---|
| D1 | | 68 | 85 | 120 | 165 | 215 | 250 | 290 |
| D2 | | 5.5 | 7 | 9 | 11 | 13.5 | 17 | 17 |
| D3 | h6 | 16 | 22 | 32 | 40 | 55 | 75 | 85 |
| D4 | g6 | 60 | 70 | 90 | 130 | 160 | 180 | 200 |
| D5 | | 18.5 | 25.8 | 36.8 | 55.2 | 69.2 | 82.2 | 92.2 |
| D6 | | M5 × 0.8P | M8 × 1.25P | M12 × 1.75P | M16 × 2P | M20 × 2.5P | M20 × 2.5P | M20 × 2.5P |
| D7 | h6 | 16 | 22 | 32 | 40 | 55 | 75 | 85 |
| D8 | | 64 | 92 | 116 | 156 | 156 | 195 | 240 |
| D9 | H6 | 15 | 20 | 30 | 40 | 55 | - | - |
| D10 | h8 | 18 | 24 | 36 | 50 | 68 | - | - |
| L1 | | 62 | 76 | 101 | 141 | 182 | 215 | 245 |
| L2 | | 28 | 36 | 58 | 82 | 82 | 105 | 130 |
| L3 | | 20 | 20 | 30 | 30 | 30 | 38 | 40 |
| L4 | | 2 | 2.5 | 3 | 3 | 3 | 3 | 3 |
| L5 | | 25 | 32 | 50 | 63 | 70 | 90 | 125 |
| L6 | | 2 | 2 | 4 | 5 | 6 | 7 | 3 |
| L7 | | 6 | 7 | 10 | 12 | 15 | 17 | 22 |
| L9 | | 4.8 | 7.2 | 10 | 12 | 15 | 15 | 15 |
| L10 | | 12.5 | 19 | 28 | 36 | 42 | 42 | 42 |
| L11 | | 121.5 | 145.5 | 163 | 219 | 258 | 277.5 | 352 |
| L12 | | 46.5 | 61.5 | 76 | 97.5 | 97.5 | 105.5 | 141 |
| L13 | | 216 | 263 | 327 | 428.5 | 467.5 | 526 | 663 |
| L16 | | 81.5 | 113.5 | 147.5 | 196.5 | 196.5 | 229 | 260 |
| L17 | | 26 | 26 | 26 | 40 | 41.5 | 52 | 60 |
| L18 | | 15 | 15 | 15 | 20 | 21.5 | 28 | 36 |
| L19 | | 21 | 22.5 | 23 | 33.5 | 33.5 | 45 | 53 |
| L20 | | 12 | 14 | 18 | 22 | 23 | - | - |
| L21 | | 22 | 22 | 32 | 33 | 32 | - | - |
| L22 | | 19 | 21 | 25 | 30 | 30 | - | - |
| L23 | | 2 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 4 |
| · L24 | | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.5 |
| B1 | h9 | 5 | 6 | 10 | 12 | 16 | 20 | 22 |
| H1 | | 18 | 24.5 | 35 | 43 | 59 | 79.5 | 90 |
| X DIN5480 | | W16 × 0.8 × 30 × 18 × 6m | W22 × 1.25 × 30 × 16 × 6m | W32 × 1.25 × 30 × 24 × 6m | W40 × 2 × 30 × 18 × 6m | W55 × 2 × 30 × 26 × 6m | W70 × 2 × 30 × 34 × 6m | W80 × 2 × 30 × 38 × 6m |

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

# Selection of the optimum gear box

**Selection Start**

**S5 Cyclic Operation**   **S1 Continuous Operation**

**YES** ← $ED<60\%$ $t_{work}<20mins$ **(Eq.1)** → **NO**

Calculate Ratio i **(Eq.2)**   |   Calculate Ratio i **(Eq.2)**

Calculate the Mean Output Torque $T_{2m}$ **(Eq.3)**   |   Calculate the Mean Output Torque $T_{2m}$ **(Eq.3)**

Calculate the Max. Acceleration Torque $T_{2max}$ **(Eq.4)**

Select a Larger Gearbox ← **NO** — $T_{2max}<T_{2B}$ $T_{2m}<T_{2N}$ — $T_{2m}<T_{2N}$ — **NO** → Select a Larger Gearbox

**YES**

Calculate the Mean Output Speed $n_{2m}$ and the Nominal Output Speed $n_{2N}$ of Gearbox **(Eq.5)** **YES**

Select a Smaller Ratio i in Larger Motor If Needed ← **NO** — $n_{2m}<n_{2N}$

**YES**

Calculate the Mean Radial $F_{2rm}$ and Axial Loads $F_{2am}$ on Output Shaft of Gearbox **(Eq.6)**

Calculate the Permitted Radial $F_{2rB}$ and Axial Loads $F_{2aB}$ on Output Shaft of Gearbox

$F_{2rm}<F_{2rB}$ $F_{2am}<F_{2aB}$ — **NO** → Select a Larger Gearbox

**YES**

Select the Required Backlash and Shaft Option

Order your APEX 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

**Motion Profile**

Output Speed Loads on Output Shaft Output Torque

$T_{2a}$, $T_{2c}$, $T_{2p}$, $T_{2d}$

$F_{2ra}$、$F_{2aa}$
$F_{2rc}$、$F_{2ac}$
$F_{2rp}$、$F_{2ap}$
$F_{2rd}$、$F_{2ad}$

$n_{2c}$
$n_{2a}$、$n_{2d}$
$n_{2p}$

$t_a$   $t_c$   $t_d$   $t_p$
$t_{cycle}$

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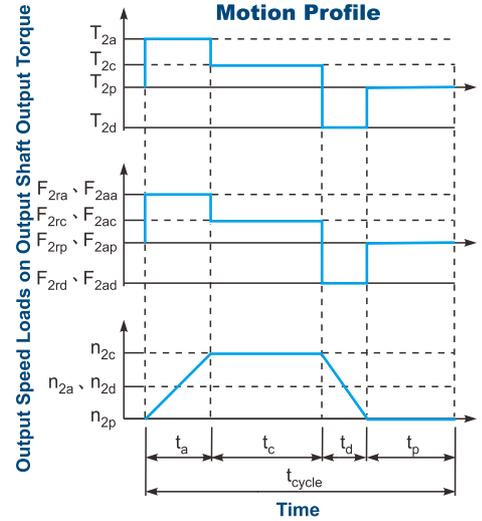
**1.** $ED = \dfrac{t_a+t_c+t_d}{t_{cycle}} \times 100\%$, $t_{work} = t_a+t_c+t_d$

Index : a. Acceleration, c. Constant,
   d. Deceleration, p. Pause    **(Eq.1)**

**2.** $i \cong \dfrac{n_m}{n_{work}}$

$n_m$   Output Speed of the Motor

$n_{work}$   Working Speed    **(Eq.2)**

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

**(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

$\eta$   Efficency of the Gearbox    **(Eq.4)**

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

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

$n_{2N} = \dfrac{n_{1N}}{i}$    **(Eq.5)**

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

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

**(Eq.6)**

# Note

**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.bjapex.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@xmapexdyna.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 DYNAMICSK OREA INC**
TEL +82-31-8179992
7-5, Aenigol-gil, Ilsandong-gu, Goyang-si, Gyeonggi-do, Republic of Korea 10301
sales@apexdynakorea.co.kr
www.apexdynakorea.co.kr

**APEX DYNAMICS JAPAN**
TEL +88-092-4511202
1-3-46, Hanmichibasi, Hakata-ku, Fukuoka, 812-0897, JAPAN
sales@apexdyna.jp
www.apexdyna.jp

**APEX DYNAMICS SINGAPORE PTE LTD**
TEL +65-62-626228
3 South Buona Vista Road, #05-15 & #06-15. SINGAPORE 118136
sales@apexdyna.com.sg
www.apexdyna.com.sg

**APEX DYNAMICS (THAILAND) CO., LTD.**
TEL +66-2-326623
87 Soi Ladkrabang 30, Ladkrabang, Ladkrabang, Bangkok 10520, Thailand
Apexthai2010@gmail.com
www.apexdyna.co. th

**APEX DYNAMICS BV**
TEL +31-492-509995
Churchilllaan 101 5705 BK Helmond, NETHERLANDS
sales@apexdyna.nl
www.apexdyna.nl
www.apexdyna.be

**APEX DYNAMICS POLSKA SP. Z O.O.**
TEL +48-12-6304728
Ul. Krakowska 50, 32-083 Balice, Poland
sales@apexdyna.pl
www.apexdyna.pl

**APEX DYNAMICS SPAIN, S.L.**
TEL +34-93-6562990
Poligono Industrial Molí dels Frares, Calle C nº 12,08620 - Sant Vicenç dels Horts, Barcelona, SPAIN
apexdyna@apexdyna.es
www.apexdyna.es

**LIMAN TRADING LIMITED FZC LLC**
P.O. Box 97 , Postal Code 322, Corporate Parks, Sohar Free Zoon, Oman

**APEKS DINAMIK REDUKTOR DISLI SAN TIC AS**
TEL +90-232-4589960
10053 SOKAK NO: 9 A.O.S.B. CIGLI – IZMIR– TURKEY
sales@apexdyna.com.tr
www.apexdyna.com.tr

**APEX DYNAMICS AUSTRALIA PTY LTD.**
TEL +613-95-852739
36 Taunton Drive, Cheltenham, Victoria 3192 AUSTRALIA.
sales@apexdyna.com.au
www.apexdyna.com.au

**APEX DYNAMICS (I) JV**
TEL +91-9607927142
Shop No. 02, S. No. 100/5, Pune-Satara Highway, Ambegaon Khurd, Pune-411046 Maharashtra, India
sales@apexdyna.co.in
www.apexdyna.co.in

**APEX DYNAMICS FRANCE SAS**
TEL +33-160-135097
11 - Burospace - 91570 - Bièvres, France
info@apexdyna.fr
www.apexdyna.fr

**APEX DYNAMICS SWEDEN AB**
TEL +46-75-2424444
Fredrikbergsgatan 2 SE-573 92 Tranås, SWEDEN
sales@apexdyna.se
www.apexdyna.se

**PT.APEX DYNAMICS INDONESIA**
TEL +62 21 29928 3681
Rukan Aralia Blok HY43 no.11, Harapan Indah II, Bekasi - Jawa Barat, INDONESIA 17214
sales@apexdyna.co.id
www.apexdyna.co.id

**APEX DYNAMICS GERMANY GMBH**
TEL +49-7171 798069-0
Marie-Curie-Straße 25 D-73529 Schwäbisch Gmünd
werner.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@apexdynaczech.cz
www.apexdynaczech.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 MIDLANDS LTD**
TEL +44-0121-737-1170
Heath House, Cheadle Rd, U?oxeter, ST14 7BY, UK
mikeg@apexdynauk.com
www.apexdynauk.com

**APEX DYNAMICS SWITZERLAND AG**
TEL +41-55-4517020
Obergasse 40, CH-8854 Galgenen, Switzerland
info@apexdyna.ch
www.apexdyna.ch

**APEX DYNAMICS MOTION (M) SDN BHDTEL**
TEL +60 7237 1055
Block A1-2, #35-03, Mercu 1 Jalan Tanjung Puteri 1, R & F Tanjung Puteri, Johor Bahru 80300, Johor.
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 DYNAMICSITALY SRL**
TEL +39 02 36634521
VIA E. DE AMICIS, 2-20091 BRESSO (MI)
info@apexdynamics.it
www.apexdynamics.it

**APEX DYNAMICS AUSTRIA GmbH**
TEL +43 720788416
Dr. Hans-Lechner-Strasse 6, 5071 Wals-Siezenheim
info@apexdynamics.at
www.apexdynamics.at

**UAB "APEKSO DINAMIKA"**
TEL +370 52078165
Medaus g. 28A, Medininku k., Vilniaus r. Sav. LT-13192
info@apexdyna.lt

**APEX DYNAMICS DENMARK**
TEL +45 73121260
Grundtvigs Allé 165, 6400 Sønderborg, Denmark
sales@apexdyna.dk
www.apexdyna.dk

**APEX DYNAMICS ISRAEL**
TEL +972-3-6470471
17 Hamefalsim St., Kiryat Arye, Petach-Tikva 4951447
Sales@apexdynamics.co.il
www.apexdynamics.co.il

**APEX DYNAMICS SLOVAKIA S.R.O.**
TEL +421919400476
Trenčianska cesta 887/52, 957 01 Bánovce nad Bebravou, Slovak republic
office@apexdyna.sk
www.apexdyna.sk

# 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 | h?p://www.apexdyna.com