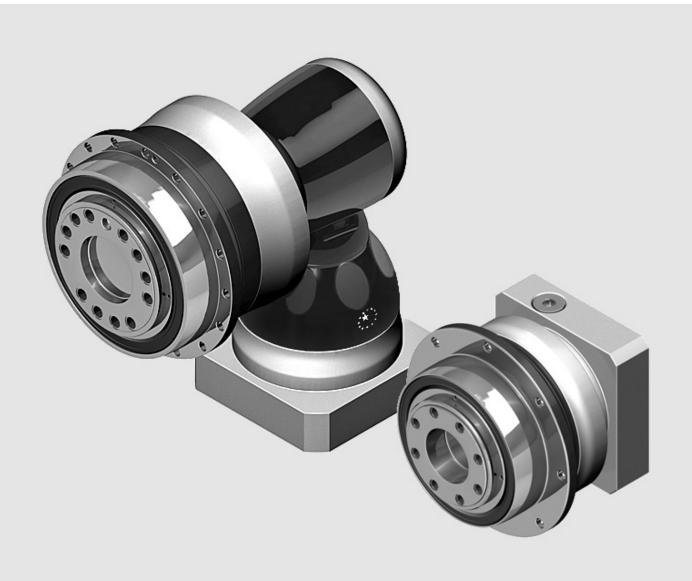# APEX DYNAMICS, INC.

## 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

| AH090 | — | 005[1] | / | MOTOR |
| AHK090 | — | 005[1] | / | MOTOR |
| AHKA285[3] | | | | |
| AHKB090[3] | | | | |

**Motor Type**

**Ratio**

**Gearbox Size**

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

**Ratio[2]**

| 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.

ISO 9001:2000 SGS
UKAS QUALITY MANAGEMENT 005

# Performance - AH Gearbox

| Model No. | | Stage | Ratio[1] | 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[3] | 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[2] | 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 $n_{IN}$ | 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 $n_{IB}$ | 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 $F_{2a}$[4] | N | 1,2 | 4~100 | 1,690 | 2,220 | 4,070 | 8,530 | 17,000 | 26,900 | 39,200 | 101,500 | 143,700 |
| Max. Tilting Moment $M_{2K}$[4] | Nm | 1,2 | 4~100 | 120 | 280 | 480 | 1,310 | 3,530 | 5,920 | 9,230 | 29,100 | 63,300 |
| 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[3] | 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) 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.

(4) Applied to the output flange center at 100 rpm.
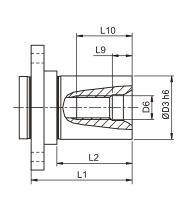
(5) Continuous operation is not recommended.
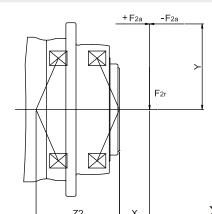
(6) 5 years warranty.

# Inertia - AH Gearbox

| Model No. | | AH064 | | AH090 | | AH110 | | AH140 | | AH200 | | AH255 | | AH285 | | AH355 | AH450 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ∅(A) (C3) | | 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 | kg.cm² | - | - | - | - | 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) ∅ = Input shaft diameter.

# Flange Shaft - AH



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

$M_{2K}$ :【Nm】

$F_{2a}, F_{2r}$ :【N】

$X, Y, Z2$ :【mm】

| 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 |

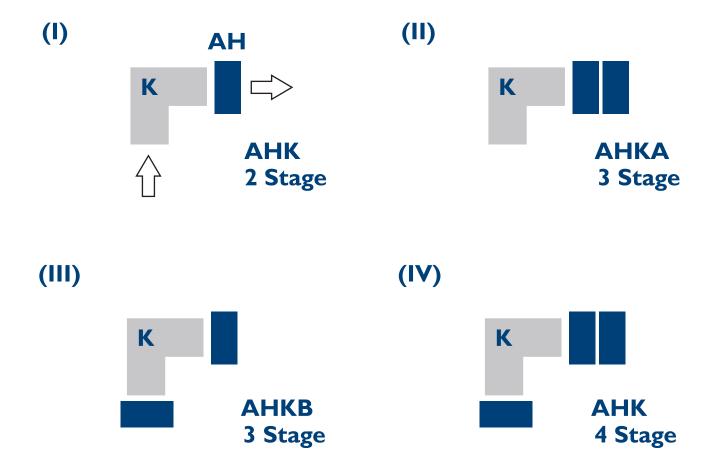Note : Applied to the output flange center at 100 rpm

# Dimension  AH Gearbox



L4  L2
L3
ØD8 (Wx)
D6 (Zx)
ØD5
ØD2
ØD1 H7
ØD3 h7
ØD4 h7
ØD7
L1
Remark (1)

AH 064    AH 090    AH 110    AH 140

AH 200    AH 255    AH 285    AH 355    AH 450
          M12 (2x)  M12 (2x)  M16 (2x)  M16 (2x)

| 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

**(I)**

AH

K

AHK
2 Stage

**(II)**

K

AHKA
3 Stage

**(III)**

K

AHKB
3 Stage

**(IV)**

K

AHK
4 Stage

# Performance - AHK ( 2 Stage ) Gearbox

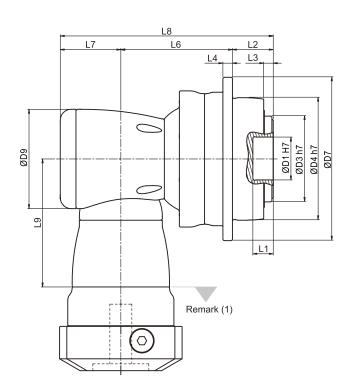| Model No. | | Stage | Ratio[1] | AHK064 | AHK090 | AHK110 | AHK140 | AHK200 | AHK255 | AHK285 | AHK355 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Nominal Output Torque $T_{2N}$ | Nm | 2 | 12 | 95 | 195 | 360 | 615 | 1,315 | – | – | – |
| | | | 15 | – | – | – | – | – | 1,770 | 3,330 | 5,595 |
| | | | 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[3] | Nm | 2 | 12~100 | 1 | 1.3 | 2 | 3.1 | 6 | 13 | 16 | 20 |
| Backlash[2] | arcmin | 2 | 12~100 | $\leqq 3$ | $\leqq 2$ | $\leqq 2$ | $\leqq 2$ | $\leqq 2$ | $\leqq 2$ | $\leqq 2$ | $\leqq 2$ |
| Torsional Rigidity | Nm/arcmin | 2 | 12~100 | 12 | 27 | 56 | 112 | 389 | 642 | 1,275 | 2,500 |
| Nominal Input Speed $n_{IN}$ | rpm | 2 | 12~100 | 3,000 | 3,000 | 2,800 | 2,700 | 2,200 | 2,100 | 2,000 | 1,600 |
| Max. Input Speed $n_{IB}$ | rpm | 2 | 12~100 | 6,000 | 6,000 | 6,000 | 4,500 | 4,500 | 4,000 | 3,000 | 2,500 |
| Max. Axial Load $F_{2a}$[4] | N | 2 | 12~100 | 1,690 | 2,220 | 4,070 | 8,530 | 17,000 | 26,900 | 39,200 | 101,500 |
| Max. Tilting Moment $M_{2K}$[4] | Nm | 2 | 12~100 | 120 | 280 | 480 | 1,310 | 3,530 | 5,920 | 9,230 | 29,100 |
| 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[3] | dB(A) | 2 | 12~100 | $\leqq 64$ | $\leqq 66$ | $\leqq 68$ | $\leqq 68$ | $\leqq 70$ | $\leqq 70$ | $\leqq 72$ | $\leqq 74$ |
| Efficiency $\eta$ | % | 2 | 12~100 | $\geqq 94\%$ | | | | | | | |

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

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

(3) The dB values are measured by gearbox with 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.

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

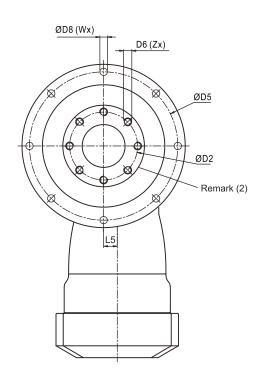(5) Continuous operation is not recommended.

(6) 5 years warranty.

# Inertia - AHK ( 2 Stage ) Gearbox

| Input Shaft (C3) $\varnothing$[A] \ Model No. | | AHK064 | AHK090 | AHK110 | AHK140 | AHK200 | AHK255 | AHK285 | AHK355 |
|---|---|---|---|---|---|---|---|---|---|
| 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 | kg.cm² | – | – | – | 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＝12~100）



Remark (1)

| 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

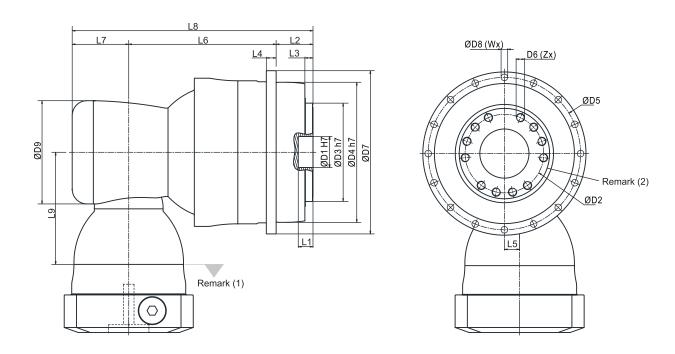| Model No. | | Stage | Ratio[1] | AHKA285 | AHKA355 | AHKA450 |
|---|---|---|---|---|---|---|
| Nominal Output Torque $T_{2N}$ | Nm | 3 | 100 | 3,345 | 5,620 | 10,965 |
| | | | 125 | 3,345 | 5,625 | 10,970 |
| | | | 140 | 3,345 | 5,625 | 10,970 |
| | | | 175 | 3,345 | 5,625 | 10,970 |
| | | | 200 | 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[3] | Nm | 3 | 100~1,000 | 6 | 6 | 13 |
| Backlash[2] | arcmin | 3 | 100~1,000 | $\leqq 2$ | $\leqq 2$ | $\leqq 2$ |
| Torsional Rigidity | Nm/arcmin | 3 | 100~1,000 | 1,275 | 2,500 | 5,100 |
| Nominal Input Speed $n_{IN}$ | rpm | 3 | 100~1,000 | 2,100 | 2,100 | 2,000 |
| Max. Input Speed $n_{IB}$ | rpm | 3 | 100~1,000 | 4,000 | 4,000 | 3,000 |
| Max. Axial Load $F_{2a}$[4] | N | 3 | 100~1,000 | 39,200 | 101,500 | 143,700 |
| Max. Tilting Moment $M_{2K}$[4] | Nm | 3 | 100~1,000 | 9,230 | 29,100 | 63,300 |
| 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[3] | dB(A) | 3 | 100~1,000 | $\leqq 72$ | $\leqq 74$ | $\leqq 76$ |
| Efficiency $\eta$ | % | 3 | 100~1,000 | $\geqq 92\%$ | | |

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

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

(3) The dB values are measured by gearbox with ratio 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.

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

(5) Continuous operation is not recommended.

(6) 5 years warranty.

# Inertia - AHKA ( 3 Stage ) Gearbox

| Model No. Input Shaft (C3) Ø[A] | | AHKA285 | AHKA355 | AHKA450 |
|---|---|---|---|---|
| 32 | kg.cm² | 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) Ø = Input shaft diameter.

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



Remark (1)

ØD8 (Wx)   D6 (Zx)   ØD5   Remark (2)   ØD2

| 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[1] | 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[3] | Nm | 3 | 64~1,000 | 0.2 | 0.2 | 0.3 | 0.4 | 1 | 1.2 | 1.5 |
| Backlash[2] | 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 $n_{IN}$ | 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 $F_{2a}$[4] | N | 3 | 64~1,000 | 2,220 | 4,070 | 8,530 | 17,000 | 26,900 | 39,200 | 101,500 |
| Max. Tilting Moment $M_{2K}$[4] | Nm | 3 | 64~1,000 | 280 | 480 | 1,310 | 3,530 | 5,920 | 9,230 | 29,100 |
| 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[3] | dB(A) | 3 | 64~1,000 | ≦ 66 | ≦ 68 | ≦ 68 | ≦ 70 | ≦ 70 | ≦ 72 | ≦ 74 |
| Efficiency $\eta$ | % | 3 | 64~1,000 | ≧ 92% | | | | | | |

(1) Ratio ( $i = N_{in} / N_{out}$ ) .
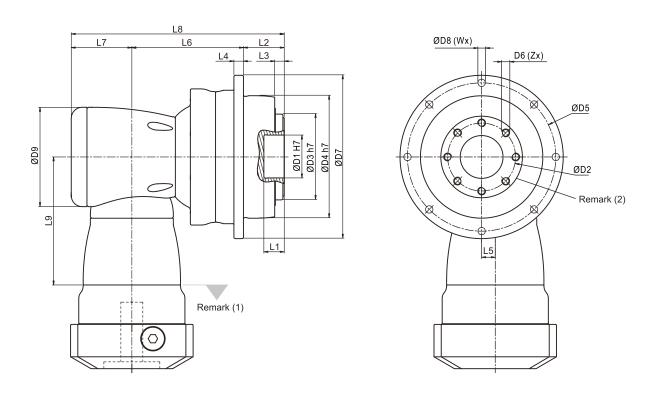
(2) Backlash is measured at 2% of Nominal Output Torque $T_{2N}$ .

(3) The dB values are measured by gearbox with ratio 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.

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

(5) Continuous operation is not recommended.

(6) 5 years warranty.

# Inertia - AHKB ( 3 Stage ) Gearbox

| Input Shaft (C3) $\varnothing$[A] Model No. | | AHKB090 | AHKB110 | AHKB140 | AHKB200 | AHKB255 | AHKB285 | AHKB355 |
|---|---|---|---|---|---|---|---|---|
| 8 | kg.cm$^2$ | 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＝64~1,000 ）



Remark (1)

| 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[1] | 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 | 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[3] | Nm | 4 | 1,225~10,000 | 0.4 | 0.4 | 1 |
| Backlash[2] | arcmin | 4 | 1,225~10,000 | ≦ 2 | ≦ 2 | ≦ 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 $F_{2a}$[4] | N | 4 | 1,225~10,000 | 39,200 | 101,500 | 143,700 |
| Max. Tilting Moment $M_{2K}$[4] | Nm | 4 | 1,225~10,000 | 9,230 | 29,100 | 63,300 |
| 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[3] | dB(A) | 4 | 1,225~10,000 | ≦ 72 | ≦ 74 | ≦ 76 |
| Efficiency η | % | 4 | 1,225~10,000 | ≧ 90% | | |

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

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

(3) The dB values are measured by gearbox with ratio 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.

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

(5) Continuous operation is not recommended.
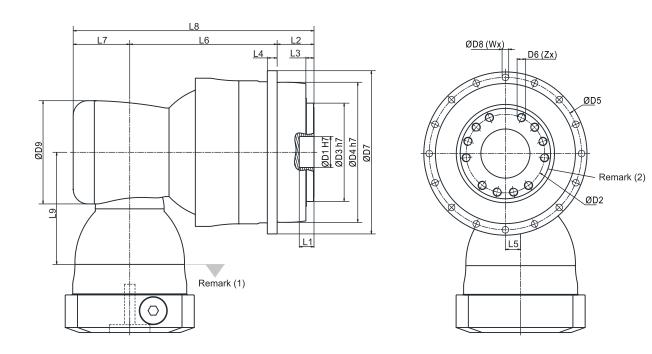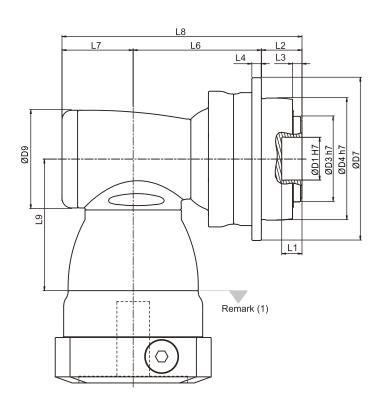
(6) 5 years warranty.

# Inertia - AHK（4 Stage）Gearbox

| Model No. Input Shaft (C3) Ø[A] | | AHK285 | AHK355 | AHK450 |
|---|---|---|---|---|
| 24 | kg.cm² | 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) Ø = Input shaft diameter.

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



Remark (1)

Remark (2)

| 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

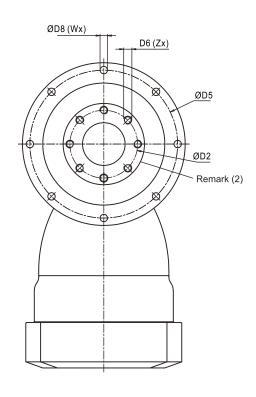| Model No. | | Stage | Ratio[1] | AHKC064 | AHKC090 | AHKC110 | AHKC140 | AHKC200 | AHKC255 | AHKC285 | AHKC355 | AHKC450 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nominal Output Torque $T_{2N}$ | Nm | 2 | 4 | 35 | 80 | 210 | 415 | 1,005 | – | – | – | – |
| | | | 5 | 35 | 80 | 210 | 415 | 1,005 | 2,050 | 3,250 | – | – |
| | | | 7 | 30 | 70 | 180 | 350 | 820 | 1,750 | 2,410 | – | – |
| | | | 8 | 35 | 80 | 210 | 415 | 1,005 | – | – | – | – |
| | | | 10 | 35 | 80 | 210 | 415 | 1,005 | 2,050 | 3,250 | – | – |
| | | 3 | 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 $T_{2NOT}$ | Nm | 2,3 | 4~91 | 2 times $T_{2N}$ | | | | | | | | |
| Max. Acceleration Torque $T_{2B}$ | Nm | 2,3 | 4~91 | 1.5 times $T_{2N}$ | | | | | | | | |
| No Load Running Torque[3] | 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[2] | 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 $n_{IN}$ | 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 $n_{IB}$ | 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 $F_{2a}$[4] | N | 2,3 | 4~91 | 1,690 | 2,220 | 4,070 | 8,530 | 17,000 | 26,900 | 39,200 | 101,500 | 143,700 |
| Max. Tilting Moment $M_{2K}$[4] | Nm | 2,3 | 4~91 | 120 | 280 | 480 | 1,310 | 3,530 | 5,920 | 9,230 | 29,100 | 63,300 |
| 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[3] | 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 ( $i = N_{in} / N_{out}$ ) .
(2) Backlash is measured at 2% of Nominal Output Torque $T_{2N}$ .
(3) The dB values are measured by gearbox with ratio 10 (2-stage) or ratio 91 (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.
(4) Applied to the output flange center at 100 rpm.
(5) Continuous operation is not recommended.
(6) 5 years warranty.

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

| Model No. | | AHKC064 | AHKC090 | | AHKC110 | | AHKC140 | | AHKC200 | | AHKC255 | | AHKC285 | | AHKC355 | AHKC450 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ø[A] (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.cm² | 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 | 15.21 | 15.68 | 15.21 | 23.46 | 15.68 | – | – |
| 38 | | – | – | – | 20.69 | – | 20.7 | 20.69 | 20.7 | 20.7 | 21.69 | 20.7 | 23.46 | 21.69 | 21.69 | – |
| 42 | | – | – | – | – | – | 22.83 | – | 22.83 | 22.83 | 23.59 | 22.83 | 25.28 | 23.59 | 23.59 | 25.28 |
| 48 | | – | – | – | – | – | 58.45 | – | 58.45 | 58.45 | 59.3 | 58.45 | 61.61 | 59.3 | 59.3 | 61.61 |
| 55 | | – | – | – | – | – | – | – | – | – | 86.95 | – | 89.67 | – | 86.95 | 89.67 |
| 60 | | – | – | – | – | – | – | – | – | – | – | – | 112.49 | – | – | 112.49 |

(A) Ø = Input shaft diameter.

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



Remark (1)

Remark (2)

| Dimension | AHKC064 | AHKC090 | | AHKC110 | | AHKC140 | | AHKC200 | | AHKC255 | | AHKC285 | | AHKC355 | AHKC450 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 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. |
| 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

**Selection Start**

**S5**
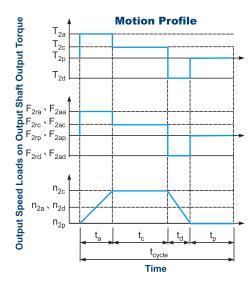**Cyclic Operation**

**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

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

The optimal design is given for

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

$J_L$　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)**

# 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 | 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'. Operating pitch circles / Diagram 1 / Backlash (transverse operation) |
| Torsional Rigidity | Nm/arcmin | Torsional Rigidity is the quotient ($\triangle$T / $\triangle$Ø) 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. Hysteresis Curve When the input shaft is locked, increase torque at the output slowly up to $T_{2B}$ 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. Backlash (defined) / Ø( arcmin ) / $\triangle$Ø / $\triangle$T / -T(Nm) / 50% / 100% / T(Nm) / Test torque / Diagram 2 / −Ø( arcmin ) |
| Radial Load And Axial Load | N | The permitted radial and axial loads on output shaft of the gearbox depend on the design of the gearbox supporting bearings. For more information, please refer to APEX website. L / X / $F_{2r}$ / $F_{2a}$ / $F_{2r}$ Radial Load / $F_{2a}$ Axial Load |
| Efficiency η | % | The transmission efficiency of the gears inside a gearbox (without friction). |
| Operating Temperature | º 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.cm² | The Moment of Inertia J1 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.

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