



## 2、选型参数

## 2、SELECTING PARAMETER

### 2.1 功率 P

$$P_1 = \frac{P_2}{\eta} \text{ [kW]}$$

$$P_{1n} \geq P_1 \cdot f_s \text{ [kW]}$$

|          |        |
|----------|--------|
| $P_1$    | 输入功率   |
| $P_2$    | 输出功率   |
| $P_{1n}$ | 电机额定功率 |
| $f_s$    | 使用系数   |
| $\eta$   | 传动效率   |

### 2.2 转速 n

|       |         |
|-------|---------|
| $n_1$ | 减速器输入转速 |
| $n_2$ | 减速器输出转速 |

若是齿轮箱外部传动装置驱动,为了优化工作条件和提高使用寿命,建议使用1400r/min或更低转速。允许输入较高的输入转速,但在这种情况下,额定扭矩M2会下降。

### 2.3 传动比 i

$$i = \frac{n_1}{n_2}$$

传动比通常为小数,在选型表中保留两位小数。

### 2.4 扭矩 M

$$M_2 = \frac{9550 \cdot P_1 \cdot \eta}{n_2} \text{ [Nm]}$$

$$M_{2n} \geq M_2 \cdot f_s \text{ [Nm]}$$

|          |        |
|----------|--------|
| $M_2$    | 输入扭矩   |
| $M_{2n}$ | 选用输出扭矩 |
| $P_1$    | 输入功率   |
| $\eta$   | 传动效率   |
| $f_s$    | 使用系数   |

### 2.5 使用系数 $f_s$

使用减速器时,应考虑一定的使用系数  $f_s$  它是根据每天的运转时间和启停频率Z确定的。

### 2.1 Power P

$$P_1 = \frac{P_2}{\eta} \text{ [kW]}$$

$$P_{1n} \geq P_1 \cdot f_s \text{ [kW]}$$

|          |                   |
|----------|-------------------|
| $P_1$    | Input power       |
| $P_2$    | Output power      |
| $P_{1n}$ | Rated motor power |
| $f_s$    | Service factor    |
| $\eta$   | Efficiency        |

### 2.2 Rotation speed n

|       |                         |
|-------|-------------------------|
| $n_1$ | Gear units input speed  |
| $n_2$ | Gear units output speed |

For optimizing working condition and improving the life when the gearbox driven by the external device, please use the speed at 1400rpm or lower. High input speed is allowed but the rated torque M2 will be decreased under such case.

### 2.3 Transmission ratio i

$$i = \frac{n_1}{n_2}$$

Generally ratio is decimal fraction with 2 radix points tagged in selecting table

### 2.4 Torque M

$$M_2 = \frac{9550 \cdot P_1 \cdot \eta}{n_2} \text{ [Nm]}$$

$$M_{2n} \geq M_2 \cdot f_s \text{ [Nm]}$$

|          |                        |
|----------|------------------------|
| $M_2$    | Output torque          |
| $M_{2n}$ | Selected output torque |
| $P_1$    | Input power            |
| $\eta$   | Efficiency             |
| $f_s$    | Service factor         |

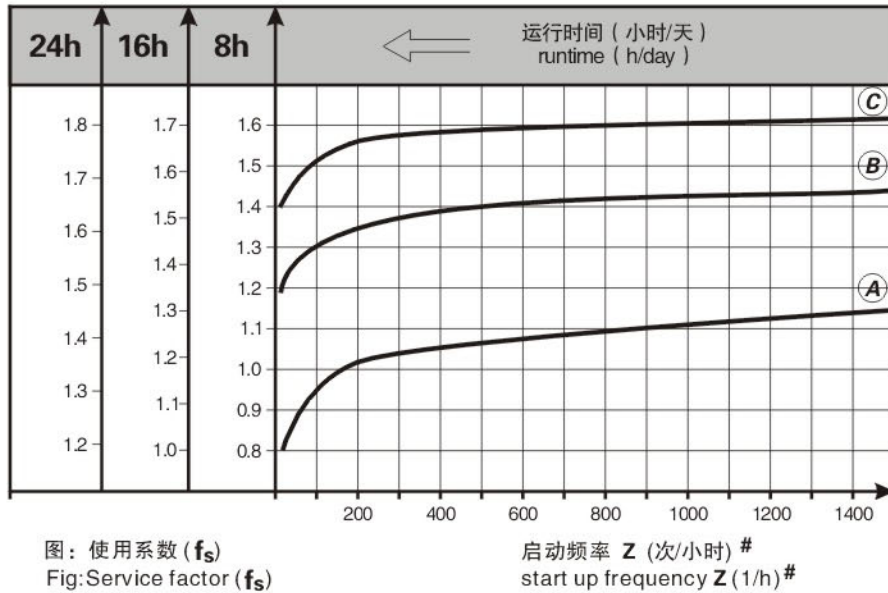
### 2.5 Service factor $f_s$

Please consider the service factor  $f_s$  when used the gearbox, the service factor is decided by running time and frequency of on-off Z per day.



根据惯性加速系数确定三种负载类型，在下图中可以读取实际应用的使用系数，按下图选取的使用系数必须小于或等于从性能参数表中提供的使用系数。

Confirming the 3 kind of loadtypes according to the inertial accelerating factor, the practical application service factors ( $f_s$ ) can be read in the below table, the selected  $f_s$  from the below table must be less than or equal to the  $f_s$  provided in the performance parameter table.



图：使用系数 ( $f_s$ )  
Fig: Service factor ( $f_s$ )

启动频率  $Z$  (次/小时) #  
start up frequency  $Z$  (1/h) #

# 启动频率  $Z$ : 周期包括所有启动、制动的次数以及变速电机高低速变化时的次数。

#Start up frequency  $Z$ : The cycle includes all start and brake times, also the times of speed changing on geared motor.

### 2.5.1 负载类型

- Ⓐ 均匀冲击负载，允许惯性加速系数  $f_a \leq 0.2$
- Ⓑ 中等冲击负载，允许惯性加速系数  $f_a \leq 3$
- Ⓒ 重冲击负载，允许惯性加速系数  $f_a \leq 10$

### 2.5.1 load classifications

- Ⓐ Uniform, permitted mass acceleration factor  $f_a \leq 0.2$
- Ⓑ Moderate shock load, permitted mass acceleration factor  $f_a \leq 3$
- Ⓒ Heavy shock load, permitted mass acceleration factor  $f_a \leq 10$

### 2.5.2 惯性加速系数

惯性加速系数计算如下：

$$f_a = \frac{J_c}{J_m}$$

- $f_a$  惯性加速系数
- $J_c$  所有外部传动惯量 ( $kgm^2$ )
- $J_m$  驱动电机的传动惯量 ( $kgm^2$ )

如果惯性加速系数  $f_a > 10$ ，请与我们技术部联系。

为了保持减速器的使用寿命，从产品样本中的性能参数表所选择的使用系数  $f_s$  应等于或略高于计算出的使用系数  $f_s$ 。

### 2.5.2 Inertial accelerating factor

The Inertial accelerating factor is calculated as follows:

$$f_a = \frac{J_c}{J_m}$$

- $f_a$  Inertial accelerating factor
- $J_c$  All external mass moments of inertia ( $kgm^2$ )
- $J_m$  Mass moment of inertia on the motor end ( $kgm^2$ )

Please contact with our technology department if the inertial accelerating factor  $f_a > 10$ .

To keep the service-life of gearbox, the use factor  $f_s$  selected from the catalogue must be equal or slightly higher than the calculated use factor  $f_s$ .



## 举例:

惯性加速系数2.5(负载类型 **B**),运行时间10小时/天, (按16小时/天查图)和每小时100次起停,查图得使用系数  $f_s=1.45$ 。

根据性能参加表所选择的使系数  $f_s \geq 1.45$ 。

## Example:

Inertial accelerating factor 2.5(load classification **B**),10hours/day operating time (read off at 16h/d)and100 cycles/hour result in a service factor  $f_s=1.45$ .

choose the service factor  $f_s = 1.45$  according to the parameter sheet.

## 2.6 径向载荷和轴向载荷

在确定影响径向载荷时,必须考虑安装在轴段上的传动件类型。不同类型的传动件的传动附加系数  $f_z$  列表如下:

| 传动件<br>Transmission element | 传动附加系数 $F_z$<br>Transmission part factor $F_z$ | 注释<br>Comments                    |
|-----------------------------|--|-----------------------------------|
| 齿轮 Gears                    | 1.15   | < 17齿 teeth                       |
| 链轮 Chain sprockets          | 1.25   | < 20齿 teeth                       |
|                             | 1.40   | < 13齿 teeth                       |
| V带轮 Narrow V-belt pulleys   | 1.75   | 有预紧力作用 Influence of tensile force |
| 平带轮 Toothed belt pulleys    | 2.50   | 有预紧力作用 Influence of tensile force |
| 齿带轮 Flat belt pulleys       | 2.50   | 有预紧力作用 Influence of tensile force |

作用在电机和齿轮轴上的径向载荷按如下公式计算:

$$F_r = \frac{M \cdot 2000 \cdot f_z}{d_0} \text{ [N]}$$

- $F_r$  作用在轴上的载荷 [N]
- $M$  作用在轴上的扭矩 [Nm]
- $d_0$  安装在轴上转动件的平均直径[mm]
- $f_z$  传动附加系数

许用径向载荷是根据轴承额定使用寿命  $L_{10h}$  来估算的 (根据 **ISO281**)。对于特殊的运行条件,许用径向载荷是根据修正使用寿命  $L_{na}$  来确定。

当作用点偏离出轴中点时,许用径向载荷须按一下公式来计算,取在x点的许可数值  $F_{x1}$  (根据轴承的使用寿命)

$$F_{x1} = F_{r(1,2)} \cdot \frac{a}{b+x} \text{ [N]}$$

- $F_{r1}, F_{r2}$  = 性能参数表中的许用径向载荷 ( $x=L/2$ ) [N]
- $x$  = 从轴肩到受力点的距离 [mm]
- $a, b,$  = 减速器径向转化常量 [mm]

## 2.6 Radial load and axial load

The types of transmission parts that mounted on the shaft end must be considered when the radial load was affected. Various transmission parts are corresponding with following transmission parts factors  $f_z$  :

The radial load forced on the motor and gear shaft is calculated as follows:

$$F_r = \frac{M \cdot 2000 \cdot f_z}{d_0} \text{ [N]}$$

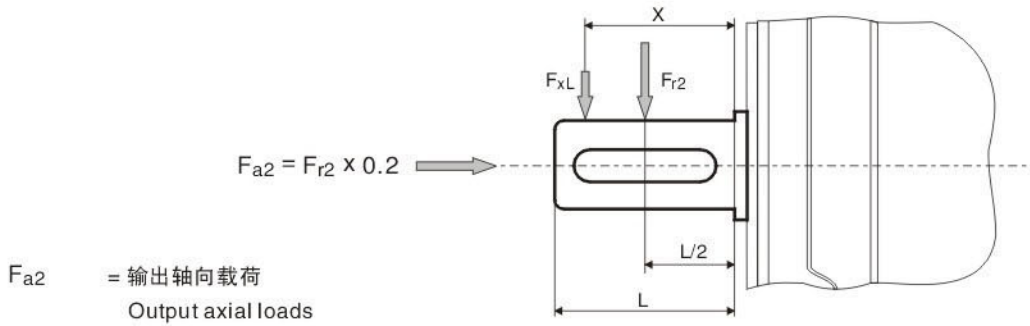
- $F_r$  Radial load [N]
- $M$  Torque on the shaft [Nm]
- $d_0$  Average diameter of the mounted transmission part in [mm]
- $f_z$  Transmission part factor

The permitted radial load is estimated by bearing rated service life  $L_{10h}$ (according to **ISO281**), and it confirmed by modificatory service life  $L_{na}$  under special running condition.

The permitted radial load must be calculated by the following formula when the loading point is deflected from the shaft center, and choose the permissible value  $F_{x1}$  on the point X(according to bearing service life)

- $F_{r1}, F_{r2}$  = Permitted radial load ( $x=L/2$ ) for foot-mounted gearbox according to the selection tables [N]
- $x$  = Distance from shaft shoulder to the pressure point [mm]
- $a, b,$  = Gearbox radial conversion constant [mm]

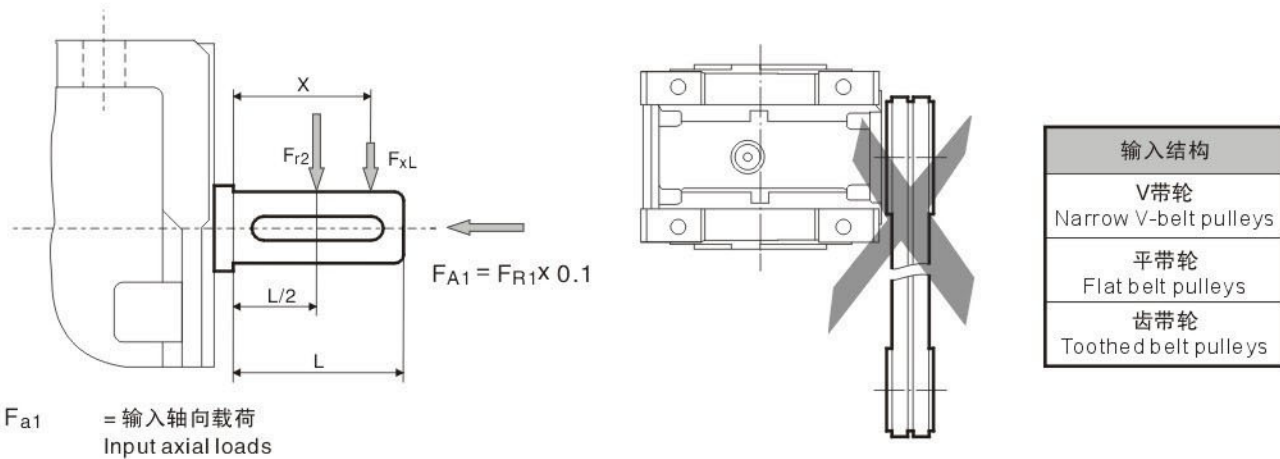




FKM减速器径向转化常量/Gearbox radial conversion constant

|   | FKM50B | FKM50C | FKM63B | FKM63C | FKM75B | FKM75C | FKM90B | FKM90C |
|---|--------|--------|--------|--------|--------|--------|--------|--------|
| a | 104    | 104    | 118    | 118    | 131    | 131    | 159    | 104    |
| b | 78     | 78     | 93     | 93     | 101    | 101    | 119    | 78     |

**输入轴径向载荷 / Input shaft radial loads**



右示图的输入不被允许使用 (包括三级输入)  
It is forbidden to use the input on the right chart (including 3 stage input).

FKM减速器径向转化常量/Gearbox radial conversion constant

|   | FKM50B | FKM50C | FKM63B | FKM63C | FKM75B | FKM75C | FKM90B | FKM90C |
|---|--------|--------|--------|--------|--------|--------|--------|--------|
| a | 51.5   | 56     | 58     | 56     | 73     | 70     | 81     | 70     |
| b | 40     | 44.5   | 43     | 44.5   | 53     | 55     | 61     | 55     |



## 2.7 选型表说明

## 2.7 Selection table instruction

|     |                  |
|-----|------------------|
| N/A | 表示减速机和输入法兰是可能的接受 |
| N/A | 表示减速机和输入法兰是不可接受的 |

|     |  |
|-----|--|
| N/A | Gearbox with such input flange is applicable     |
| N/A | Gearbox with such input flange is not applicable |

- \* 表示速比可除尽
- P<sub>1n</sub>** 电机额定功率 [kW] ;
- n<sub>2</sub>** 输出转速[r/min];
- M<sub>2n</sub>** 输出扭矩 [Nm] ;
- M<sub>2max</sub>** 最大允许输出扭矩 [Nm] ;
- F<sub>r2</sub>** 输出轴径向载荷 [N] ;
- i** 减速机公称传动比;
- i<sub>a</sub>** 减速机实际传动比;
- f<sub>s</sub>** 使用系数;

- \* Ratio is divisible;
- P<sub>1n</sub>** Rated motor power;
- n<sub>2</sub>** Output speed;
- M<sub>2n</sub>** Output torque;
- M<sub>2max</sub>** Max.permmissible output torque
- F<sub>r2</sub>** Ouput shaft radial load
- i** Gearbox nominal ratio;
- i<sub>a</sub>** Gearbox actual ratio;
- f<sub>s</sub>** Service factor;



减速机型号;



Gearbox type;



电机型号;



Motor type;

Page 外形尺寸表页码;

Page Dimension sheet page no;

## 3、选型举例

## 3、SELECTION EXAMPLE

### 3.1 减速电机

### 3.1 Geared motor

例：被驱动设备所需功率0.37kW,工作8小时/天，中等冲击，启动频率100次/小时，输出转速n<sub>2</sub>=7r/min，减速机要求B3安装，则：

Example: Required power 0.37kW on driven machine, work for 8 h/day, moderate shock load,start up frequency 100(1/h),n<sub>2</sub>=7r/min, B3 mounted,

So:

查 P6 使用系数图标即可选使用系数f<sub>s</sub> =1.3

Check the service factor table at page 6 , choose f<sub>s</sub> =1.3

$$i = \frac{n_1}{n_2} = \frac{1400}{7} = 200$$

$$P_{1n} \geq P_1 \cdot f_s = \frac{P_2}{\eta} \cdot f_s = \frac{0.37}{0.94} \times 1.3 = 0.512 \text{ [kW]}$$

查KPM/KPB系列性能参数表可确定减速电机型号为：

**KPM75C-200-71B5-7124-B3**

Choose type:

**KPM75C-200-71B5-7124-B3**



### 3.2 减速机

例:被驱动设备所需扭矩为130Nm,工作8小时/天,均匀冲击负载,启动频率200次/小时,减速机要求FA1法兰安装,减速器要求输入转速 $n_1=1400\text{r/min}$ ,输出转速 $n_2=90\text{r/min}$ ,查性能参数表可知,只能选三级传动形式。

查 P6 使用系数图标即可选使用系数  $f_s=1.02$

$$i = \frac{1}{n_2} = \frac{1400}{90} = 15.5$$

$$M_{2n} \geq M_2 \cdot f_s = 130 \times 1.02 = 132.6 \text{ [Nm]}$$

$$P_{1n} \geq P_1 \cdot f_s = \frac{M_2 \cdot n_1}{9550 \cdot \eta \cdot i} \cdot f_s = \frac{132.6 \times 1400}{9550 \times 0.94 \times 15} \times 1.02 = 1.4 \text{ [kW]}$$

**FKM63B-15-FA1-90B5**

### 3.2 Gearbox

Example: Required 130Nm on driven machine, work for 8 h/day, start up frequency 200(1/h), **FA1** mounted  $n_1=1400\text{r/min}$ ,  $n_2=90\text{r/min}$ , so the only selection is 3 stage after checked the table:

Check the service factor table at page 6 , choose  $f_s=1.02$

Choose type:

**FKM63B-15-FA1-90B5**