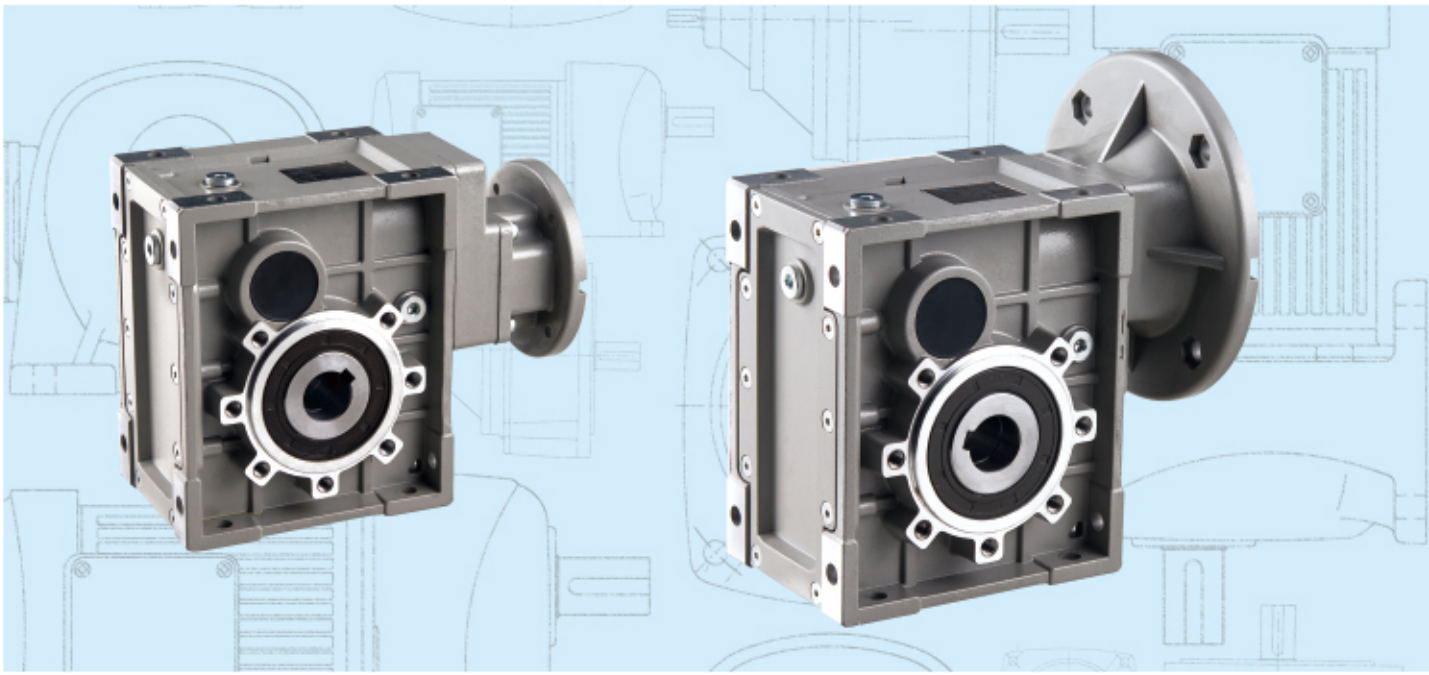
KM SERIES
HYPOID GEAR REDUCER

KM系列准双曲面齿轮减速器



KM SERIES HYPOID GEAR REDUCER

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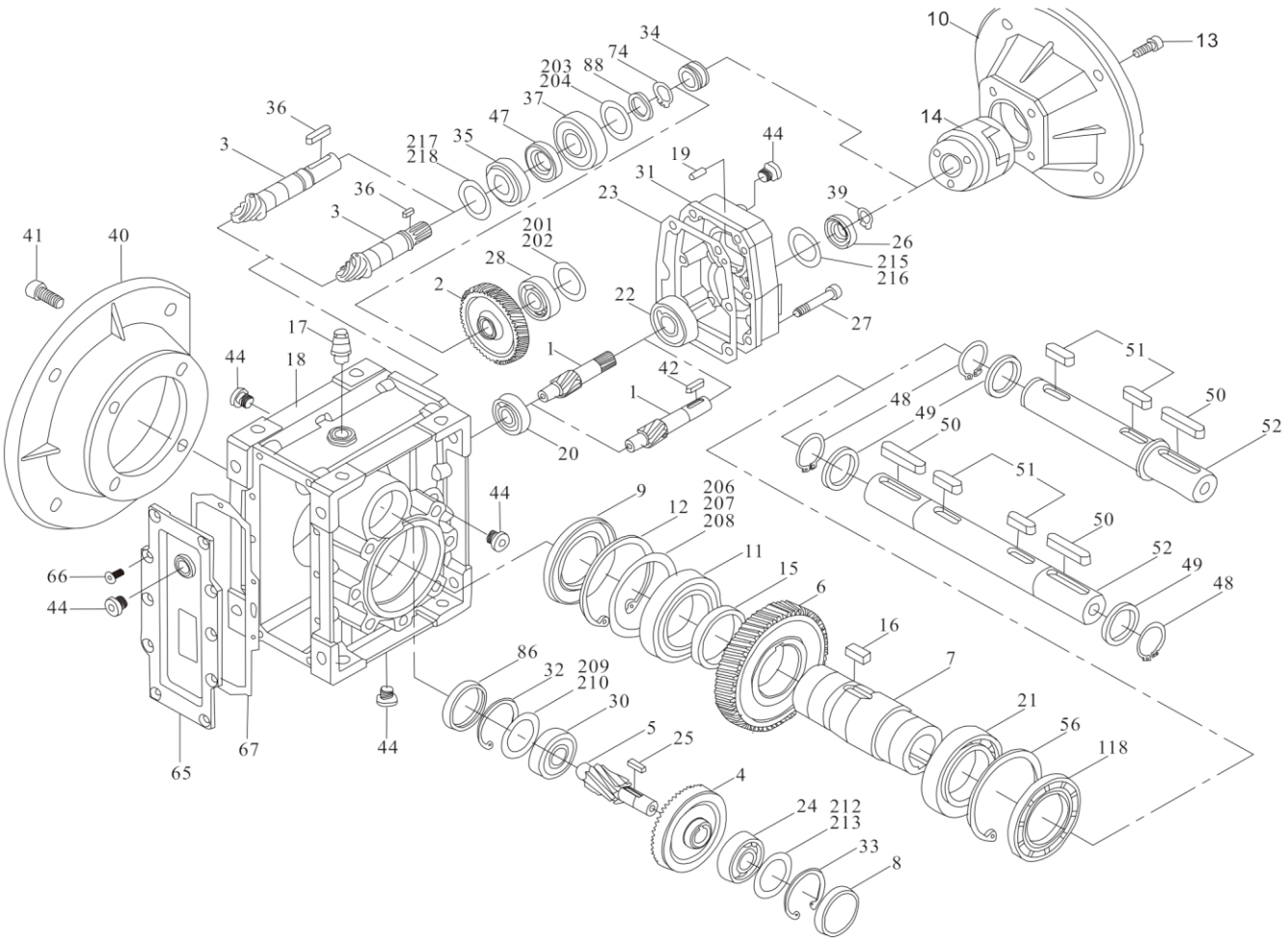


1 主动齿轮 / Pinion	25 键 / Key	65 齿轮箱盖板 / Gearcase cover
2 从动齿轮 / Gear	26 油封 / Oil seal	66 内六角沉头螺钉 / Hexagon sunk screw
3 主动齿轮轴 / Pinion shaft	27 内六角螺钉 / Inner hex screw	67 橡胶垫 / Rubber gasket
4 从动齿轮 / Gear	28 轴承 / Anti-friction bearing	74 轴用挡圈 / Shaft-circlip
5 主动齿轮轴 / Pinion shaft	30 轴承 / Anti-friction bearing	86 油封盖 / Closing cap
6 从动齿轮 / Gear	31 三级齿轮箱 / 3 stage gearcase	88 垫圈 / Washer
7 输出轴 / Hollow shaft	32 孔用挡圈 / Hole-circlip	118 油封 / Oil seal
8 油封盖 / Closing cap	33 孔用挡圈 / Hole-circlip	201 调整垫片 / Shim ring
9 油封 / Oil seal	35 轴承 / Anti-friction bearing	202 调整垫片 / Shim ring
10 输入法兰 / Intput flange	36 键 / Key	205 调整垫片 / Shim ring
11 轴承 / Anti-friction bearing	37 轴承 / Anti-friction bearing	206 调整垫片 / Shim ring
12 孔用挡圈 / Hole-circlip	39 轴用挡圈 / Shaft-circlip	207 调整垫片 / Shim ring
13 内六角螺钉 / Inner hex screw	40 输出法兰 / Output flage	208 调整垫片 / Shim ring
14 联轴器 / Coupling	41 内六角螺钉 / Inner hex screw	209 调整垫片 / Shim ring
15 间隔套 / Spacer	42 键 / Key	210 调整垫片 / Shim ring
16 键 / Key	44 油塞 / Oil plug	211 调整垫片 / Shim ring
17 排气阀 / Breather valve	47 油封 / Oil seal	212 调整垫片 / Shim ring
18 齿轮箱体 / Gearcase	48 轴用挡圈 / Shaft-circlip	213 调整垫片 / Shim ring
19 圆柱销 / Stifte	49 垫片 / Gasket	214 调整垫片 / Shim ring
20 轴承 / Anti-friction bearing	50 键 / Key	215 调整垫片 / Shim ring
21 轴承 / Anti-friction bearing	51 键 / Key	216 调整垫片 / Shim ring
22 轴承 / Anti-friction bearing	52 双向输出轴 / Double output shaft	217 调整垫片 / Shim ring
23 密封纸垫片 / Housing gasket	53 单向输出轴 / Single output shaft	
24 轴承 / Anti-friction bearing	56 孔用挡圈 / Hole-circlip	

概 述 | SUMMARIZE

1.1 产品特点

KM系列准双曲面齿轮减速器是我公司最新研发的新一代实用性产品。具有以下一些主要特点：

1.采用准双曲面齿轮传动，传动比大；

2.输出扭矩大，传动效率高，节能环保；

3.优质铝合金铸造，重最轻，不生锈；

4.传动平稳，噪音小，适合在恶劣环境中长期连续工作；

5.美观耐用，体积小；

6.可适应全方位安装，应用广泛，使用方便；

7.**KM**系列减速器安装尺寸与**NMRV**系列蜗轮蜗杆减速器完全兼容（**KM28**与**NMRV050**部分尺寸不同）；

8.模块化组合，可多种形式组合，满足各种传动条件的需求。

1.1 Products features

KM series helical-hypoid gear units isa new-gen eration of product developed by our company.with a compromise of advanced technol-ogy both at home and abroad, its main features are as follows:

1. Driven by hypois gear, has big ratios.
2. Large in output torque, high efficiency, energy saving and environmental protection.
3. Made of high-quqlity aluminum alloy, light in weight and nonrusting.
4. Smooth in running and low in noise, can work long time in dreadful conditions.
5. Good-looking in appearance, durable in life service and small in volume.
6. Suitable for all round installation. wide application and easy of use.
7. The mounting dimension of **KM** series are compatible with **NMRV** series worm gear unit(A part of **NMRV050** dimensions are different from **KM28**) .
8. Modulaw and multistructure can meet the demands of various conditions.
9.Modulaw and multistructue can meet the demands of various conditions.

1.2 主要材料

1.外壳：铝合金（机座：28-58）；

2.齿轮：20CrMnTiH1，渗碳淬火，齿面硬度56-62 HRC，精磨后保持渗碳层厚度0.3-0.5mm；

1.2 Main materials

1.Housing: die-cast aluminum alloy (frame size: 28 to 58).
2.Gear wheel: 20CrMnTiH1, carbonize & quencher heat treatment make the hardness of gear's surface up to 56-62 HRC, retain carbuzation layer's thickness between 0.3 and 0.5mm after precise grinding.

1.3 表面涂装

铝合金外壳：

1.先抛丸处理，再经去油处理 ，再喷RAL5010蓝色涂料，（其他颜色可根据客户需求在作调整）。

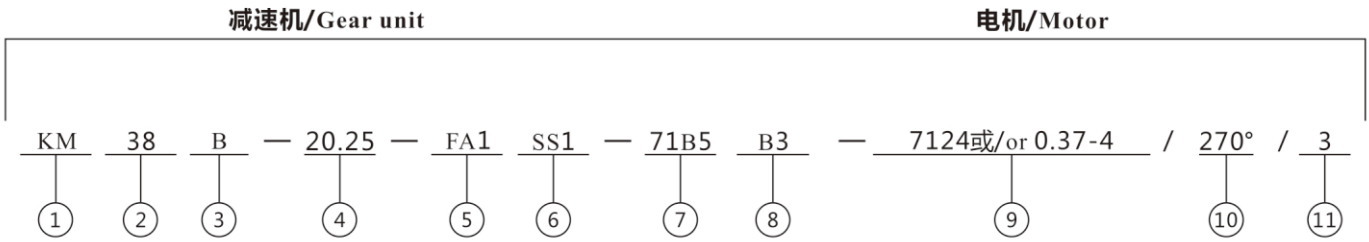
1.3 Surface painting

Aluminum alloy housing:

1. First shot blasting, then degreasing, and then spray RAL5010 blue paint (other colors can be adjusted according to customer needs).

型号说明 | MODEL ILLUMINATE

2.1 减速机或减速机+IEC电机 / Gear unit or gearunit+IEC motor



NO	说明	Comments
1	减速机系列代号：**KM**	Code for gear units series:**KM**
2	减速机规格代号：28、38、48、58、68	Specification code of gear units:28.38.48.58.68
3	1）.**B**:表示2级传动 2）.**C**:表示3级传动	1）.**B**:Means 2 stages 2）.**C**:Means 3 stages
4	减速机速比 i	Speed ratio of reducer i
5	1）.无代号表示不带输出法兰 2）.**FA、FB、FC、FD、FE（1/2）**： 输出法兰代号和位置	1）.No mark means without output flange 2）.**FA,FB,FC ,FD,FE(1/2)**:output Flange and position
6	1）.无代号表示孔输出 2）.**SS（1/2）**：单向输出轴和位置 3）.**DS**：双向输出轴 4）.H(1/2):H表示带锁紧盘空心轴,1或2表示锁紧盘位置	1）.No mark means hole output 2）.**SS(1/2)**:Single output shaft and position 3）.**DS**:Double output shaft 4）.h(1/2):Hollow shaft with shrink disk and position
7	1）.输入法兰规格代号 （63B5、71B5、71B14.....） 2）.HS:表示轴输入	1）.Input flange code（63B5、71B5、71B14.....） 2）.**HS**：means shaft input
8	安装方位代号 （B3 B6 B7 B8 V5 V6）（见P.G26）	Installation position code
9	1）.无代号表示不带制动器 2）.电机型号或功率、极数	1）.No mark means without brake 2）.Model motos(poles of power)
10	电机接线盒位置，默认位置0°（R）可以不写 （见P.G26）	Position of motor terminal box, default position 0°（R） not to write out is ok
11	电机进线位置，默认位置 S 可以不写（见P.G26）	Coil Position for motor, default position S not to write out is ok

注：订单时请说明是否带电机，一般按不带电机供应。

NOTE:

When ordering, you should show whether the reducers are equipped with motors, otherwise reducers aren't supplied with motors.

示例：

Example:

KM28B-12.47-B3-71B5

选型相关参数 | RELEVANT PARAMETER

3.1 功率 P

$$P_1 = \frac{P_2}{\eta}\ [KW]$$

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

P1 输入功率
P2 输出功率
P1n 电机额定功率
fs 使用系数
η 传动效率

KM系列减速器的效率是根据传动级数确定，2级传动效率η为92%，3级传动效率η为90%。

3.2 转速 n

n1 减速器输入转速
n2 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。

3.3 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。

3.4 扭矩 M

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

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

M2 输出扭矩
M2n 选用输出扭矩
P1 输入功率
η 传动效率
fs 使用系数

3.5 使用系数 fs

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

3.1 Power P

$$P_1 = \frac{P_2}{\eta}\ [KW]$$

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

P1 Input power
P2 Output power
P1n Rated power driving motor
fs Service factor
η Transmission efficiency

The efficiency of KM gear units varies with the number of gear stages, between 94%(2-stage), 92 % (3-stage).

3.2 Rotation speed n

n1 Gear units input speed
n2 Gear units output speed

If driven by the external gearing,1440r/min or lower rotation speed is suggested so as to optimize the working conditions and prolong the service life.Higher input rotation speed is permitted, but in this situation, the rated torque M2 will be reduced.

3.3 Transmission ration i

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

Usually transmission ratio is decimal fraction with 2radix point tagged in selection tables .

3.4 Tourque M

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

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

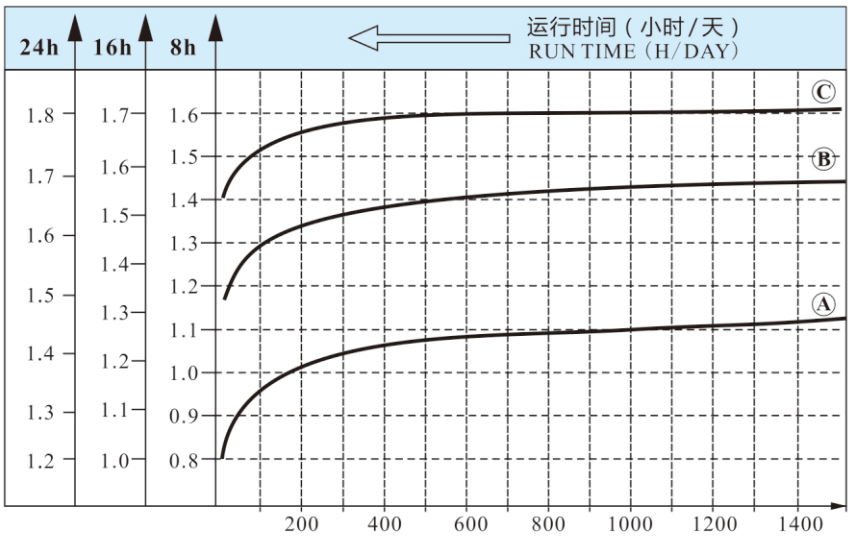
M2 Output torque
M2n Selected output torque
P1 Input power
η Transmission efficiency
fs Service factor

3.5 Service factor fs

The effect of the driven machine on the gear unit is taken into account to a sufficient level of accuracy using the service factor fs. The service factor is determined according to the daily oper-ating time and the starting frequency z. three load classifications are considered depending on the mass acceleration factor. You can read off the service factor applicable to your application in following figure.

使用此图选择的服务系数必须小于或等于性能参数表中给出的服务系数。

The service factor selected using this diagram must be less than or equal to the service factor as given in the performance parameter table.



使用系数（fs） Service factor(fs)　　启动频率Z（次/小时）# Start frequency Z(1/h)#

启动频率 Z：周期包括所有启动、制动次数以及变速电机高低速的变化时的次数。

Starting frequency **Z**: The cycles include all starting and braking procedures as well as change overs from low to high speed.

3.5.1 负载类型

Ⓐ 均匀冲击负载，允许惯性加速系数 fa≤0.2

Ⓑ 中等冲击负载，允许惯性加速系数 fa≤3

Ⓒ 重冲击负载，允许惯性加速系数 fa≤10

3.5.1 load classifications

Uniform, permitted mass acceleration fact or fa≤0.2

Moderate shock load, permitted mass acceleration factor fa≤3

Heavy shock load, permitted mass acceleration factor fa≤10

负载类型：

轻负载的螺杆输送，风扇，装备线，输送带，小型搅拌器，电梯，清洗机器，过滤器，控制驱动。

卷扬机，木工机器进料器，货物起重机，平衡器，绞螺纹机器，中型搅拌器，重型输送带，绞盘，滑动闸门，刮料机，包装机械，混凝土搅拌机.行车驱动装置，铣床，齿轮泵。

大型搅拌器，剪床，压机，离心机，旋转支撑装置，重型绞盘和起重机，磨床，石材打磨机，翻斗机，钻床，冲床，凸轴压机，摺床，机床转盘，翻桶装置，震荡装置，破碎机。

Oad classifications:

Screw feeders for light materials, fans, assembly lines, conveyor belts for light materials, small mixers, lifts, cleaning machines, fillers, control machines.

Winding devices, woodworking machine feeders, goods lifts, balancers, threading machines, medium mixers, conveyor belts for heavy materials, winches.sliding doors, fertilizer scrapers, packing machines, concrete mixers, crane mechanisms, milling cutters.folding machines, gear pumps.

Mixers for heavy materials, shears,presses,centrifuges, rotating supports, winches and lifts forheavy materials, grinding lathes, stone mills, bucket elevators, drilling machines, hammer mills, cam presses, folding machines, turntables, tumbling barrels, vibrators, shredders.

3.5.2 惯性加速系数

惯性加速系数计算如下：

$$fa = \frac{Jc}{Jm}$$

3.5.2 Mass acceleration factor

The mass acceleration factor is calculated as follcws:

$$fa = \frac{Jc}{Jm}$$

fa 惯性加速系数
Jc 所有外部传动惯量（kgm^2）
Jm 驱动电机的传动惯量（kgm^2）
如果惯性加速系数fa>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fs应等于或略高于计算出的使用系数fs。

举例：

惯性加速系数2.5（负载类型Ⓑ），运行时间14小时/天，（按16小时/天查图）和每小时200次起停，查图得使用系数fs =1.48。

根据性能参数表所选择的使用系数fs ≥1.48。

f_a Mass acceleration factor
J_c All external mass moments of inertia (kgm)
J_m Mass moment of inertia on the motor end (kgm) If Mass acceleration factors **fa**>10, please call our technical service.

To keep the service-life of gear units, the use factor fs selected from the catalogue must be equal or slightly higher than the calculted use factor fs.

Example:

Mass acceleration factor 2.5 (load classification), 14 hours/day operating time (read off at 16 h/d) and 200 cycles/hour result in a service factor fs=1.48.
Choose the service factor fs = 1.48 according to the parameter sheet.

3.6 径向载荷和轴向载荷

在确定影响径问载荷时，必须考虑安装在轴端上的传动件类型，不同类型的传动件的传动附加系数fz列表如下：

3.6 Overhung loads and axial forces

When determining the resulting radial loads. the type of transmission elements, mounted on thaft end must be considered. Various transmisson elements are corresponding with following transmission element factors f ：

传动件 Transmission element	传动附加系数Fz Transmission element factor Fz	注塑 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 the tensile force
平带轮 Flat belt pulleys	2.50	有预紧力作用 Influence of the tensile force
齿带轮 Toothed belt puilleys	2.50	有预紧力作用 Influence of the tensile force

作用在电机和齿轮轴上的径向载荷按如下公式计算：

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

F_r 作用在轴上的载荷[N]
M 作用在轴上的扭矩[Nm]
d_0 安装在轴上传动件的平均直径[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L10h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Lna来确定。

The overhung loads exerted on the motor or gear shaft is then calculated as follows:

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

F_r Resulting radial load [N]
M Torque on the shaft [Nm]
d_0 Mean diameter of the mounted transmission element in [mm]
f_z Transmission element factor

The basis for determining the permitted radial loads is the computation of the rated service life L10h of the bearings (according to IS0281). For special operating conditions, the permitted radlar loads can be determined with regard to the modired service life Lna.

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

根据轴承的使用寿命公式:

$$F_{XL}=F_{r(1.2)}\cdot\frac{a}{b+x}[N]$$

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]

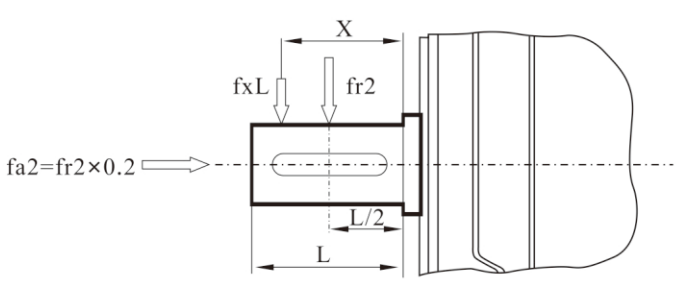
The permitted radial loads given in the selection tables must be calculated using the following formula in the event of force application not in the center of the shaft end. The smaller of the two values F_{XL} (according to bearing service life)

F_{xL} according to bearing service life:

$$F_{XL}=F_{r(1.2)}\cdot\frac{a}{b+x}[N]$$

F_{r1}. F_{r2} =Permitted overhung load (x =L/2) for foot-mounted gear units according to he selec-tion tables in [N]
x =Distance from the shaft shoulder to the force application point in [mm]
a, b = Gear unit constant for overhung load conversion [mm]

输出轴径向载荷 / Output shafts radial loads

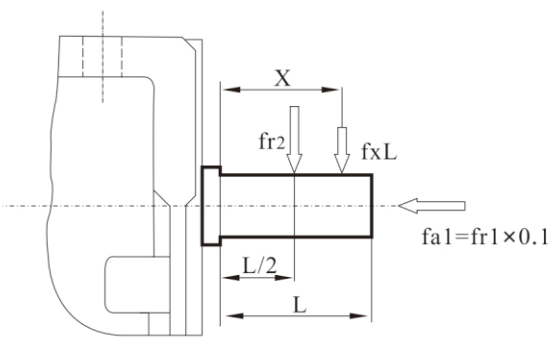


F_{a2} =输出轴向载荷
Output axial loads

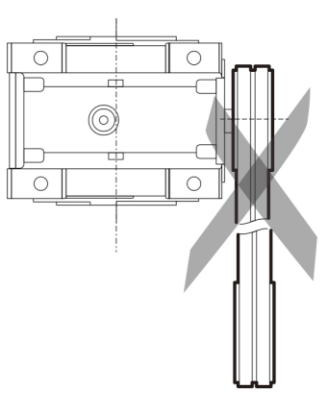
KM减速器径向转化常量 / Gear unit constantsfor overhung load conversion：

	KM28B	KM28C	KM38B	KM38C	KM48B	KM48C	KM58B	KM58C	KM68B	KM68C
a	104	104	118	118	131	131	159	159	174	174
b	78	78	93	93	101	101	119	119	134	134

输入轴径向载荷 Input shafts radial loads



F_{a1} =输入轴向载荷
Input axial loads



输入结构
Narrow V-bolt pulleys V带轮
Flat belt pulleys 平带轮
Toothed belt pulleys 齿带轮

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).

Km减速器径向转化常量 / Gear unit constantsfor overhung load conversion:

	KM28B	KM28C	KM38B	KM38C	KM48B	KM48C	KM58B	KM58C	KM68B	KM68C
a	51.5	56	58	56	73	70	81	70	101	87
b	40	44.5	43	44.5	53	55	61	55	76	67

选型举例 | SELECTION EXAMPLE

4.1 减速电机

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n2=28r/min.减速机要求B3安装，则：

查P5使用系数图表即可选使用系数fs=1.3

查KM系列性能参数表可确定减速电机型号为：

KM28B-50-71B5-B3

4.1 Gear motor

Example: Required power 0.37KWon driven machine,work for 8 h/day, moderate shock load, start up frequency 100(1/h), n2-28r/min, B3 mounted.

So:

Check the service factor table at page 7, choose fs=1.3

$$i=\frac{n_1}{n_2}=\frac{1400}{28}=50$$

$$P_{1n}\geq P_1\cdot f_s=\frac{P_2}{\eta}\cdot fs\ \frac{0.25}{0.94}\times 1.3=0.345[KW]$$

Choose type:

KM28B-50-71B5-B3

4.2 减速器

例：被驱动设备所需扭矩为200Nm，工作8小时/天，均匀冲击负载，启动频率400次/小时，减速机要求FA1法兰安装，减速器要求输入转速900r/min，输出转速n2=6r/min，查性能参数表可知，只选能三级传动形式。

查P5使用系数图表即可选使用系数fs=1.05

查KM系列性能参数表可确定减速型号为：

KM48C-151.20-FA1

4.2 Gear units

Example: Recluired torque 200Nrn on driven machine, work 8 h/day, uniform load, start upfrequency 400(1/h), FA1 mounted, n1=900 r/min, n2-2.5 r/min, so the only selection is 3 stage after checked the table:

Check the service factor table at page 5, choose fs=1.05

$$i=\frac{n_1}{n_2}=\frac{900}{6}=150 \qquad M_{2n}\geq M_2\cdot f_s=200\times 1.05=210\ [Nm]$$

$$P_{1n}\geq P_1\cdot f_s=\frac{M2\cdot n1}{9550\cdot \eta\cdot i}\cdot f_s=\frac{210\times 900}{9550\times 0.92\times 150}X1.05=0.151[KW]$$

Choose type:

KM48C-151.20-FA1

减速选型表 | GEAR UNIT SELECTION TABLES

5.1 减速器组合表 / Possible geometrical combinations

KM28..减速机组合表（n_1=1400r/min）
KM28.. Possible geometrical combinations（n_1=1400r/min）

160Nm

减速机型号 Gear units	i 公称 Nomial	i 实际 Actual	n_2 [r/min]	M2max [Nm]	Fr_2 [N]	63B5	71B5 71B14	80B5 80B14	90B5 90B14
3级 / Stage									
KM28C	300	294.05	4.8	130	4100				
KM28C	250	244.29	5.8	130	4100				
KM28C	200	200.44	7.0	130	4100				
KM28C	150	146.67	9.6	160	4000				
KM28C	125	120.34	12	160	3770				
KM28C	100	99.41	14	160	3560				
KM28C	90	91.48	15.5	160	3330				
KM28C	75	74.62	19	160	3220				
2级 / Stage									
KM28B	60	58.81	24	130	2960				
KM28B	50	48.86	29	130	2790				
KM28B	40	40.09	35	130	2610				
KM28B	30	30.54	48	160	2350				
KM28B	25	24.86	59	160	2200				
KM28B	20	19.88	70	160	2080				
KM28B	15	14.92	94	160	1880				
KM28B	12. 5	12.47	113	160	1770				
KM28B	10	10.30	134	160	1670				
KM28B	7. 5	7.73	182	160	1510				

KM38..减速机组合表（n_1=1400r/min）
KM38..Possible geometrical combinations（n_1=1400r/min）

200Nm

减速机型号 Gear units	i 公称 Nomial	i 实际 Actual	n_2 [r/min]	M2max [Nm]	Fr_2 [N]	63B5	71B5 71B14	80B5 80B14	90B5 90B14
3级 / Stage									
KM38C	300	302.5	4.7	160	4800				
KM38C	250	243.57	5.8	160	4800				
KM38C	200	196.43	7.2	160	4800				
KM38C	150	151.56	9.3	180	4650				
KM38C	125	122.22	12	180	4330				
KM38C	100	101.27	14	180	4070				
KM38C	90	91.25	16	180	3920				
KM38C	75	73.33	20	180	3650				
2级 / Stage									
KM38B	60	60.50	24	160	3430				
KM38B	50	48.71	29	160	3190				
KM38B	40	39.29	36	160	2970				
KM38B	30	30.31	47	180	2720				
KM38B	25	24.44	58	180	2530				
KM38B	20	20.25	70	180	2380				
KM38B	15	15.71	96	180	2130				
KM38B	12. 5	12.67	111	180	2030				
KM38B	10	10.50	134	180	1910				
KM38B	7. 5	7.60	185	180	1710				

减速选型表 | GEAR UNIT SELECTION TABLES

减速器组合表 / Possible geometrical combinations

KM48..减速机组合表（n_1=1400r/min）
KM48.. Possible geometrical combinations（n_1=1400r/min）

350Nm

减速机型号 Gear units	i 公称 Nomial	i 实际 Actual	n_2 [r/min]	M2max [Nm]	Fr_2 [N]	63B5	71B5 71B14	80B5 80B14	90B5 90B14	100B5 100B14	112B5 112B14
3级 / Stage											
KM48C	300	297.21	4.7	350	6500						
KM48C	250	240.89	5.8	350	6500						
KM48C	200	200.66	7.0	300	6500						
KM48C	150	151.20	9.3	350	6360						
KM48C	125	121.02	11.6	300	5980						
KM48C	100	100.81	14	240	5520						
KM48C	75	79.41	17.7	200	5040						
2级 / Stage											
KM48B	60	59.44	27.8	350	4660						
KM48B	50	48.18	29	350	4340						
KM48B	40	40.13	34.9	300	4080						
KM48B	30	29.86	46.9	350	3720						
KM48B	25	24.20	57.9	300	3500						
KM48B	20	20.16	69.4	240	3230						
KM48B	15	15.88	88.2	200	2950						
KM48B	12. 5	12.49	112	300	2770						
KM48B	10	9.84	142.3	240	2550						
KM48B	7. 5	7.48	187.2	200	2330						

KM58..减速机组合表（n_1=1400r/min）
KM58..Possible geometrical combinations（n_1=1400r/min）

500Nm

减速机型号 Gear units	i 公称 Nomial	i 实际 Actual	n_2 [r/min]	M2max [Nm]	Fr_2 [N]	63B5	71B5 71B14	80B5 80B14	90B5 90B14	100B5 100B14	112B5 112B14
3级 / Stage											
KM58C	300	295.18	4.7	500	8300						
KM58C	250	240.89	5.8	500	8300						
KM58C	200	200.66	7.0	480	8300						
KM58C	150	151.20	9.3	500	8050						
KM58C	125	125.95	11.1	480	7580						
KM58C	100	99.22	14.1	380	7000						
KM58C	75	75.45	18.5	300	6390						
2级 / Stage											
KM58B	60	59.04	23.7	500	5890						
KM58B	50	48.18	29.0	500	5500						
KM58B	40	40.13	34.9	480	5170						
KM58B	30	30.24	46.3	500	4710						
KM58B	25	25.19	55.6	480	4430						
KM58B	20	19.84	70.56	380	4090						
KM58B	15	14.99	93.3	300	3730						
KM58B	12. 5	12.49	112	480	3510						
KM58B	10	9.84	142.3	380	3240						
KM58B	7. 5	7.48	187.2	300	2950						

减速选型表 | GEAR UNIT SELECTION TABLES

减速器组合表 / Possible geometrical combinations

KM68..减速机组合表 (n_1=1400r/min)
KM68.. Possible geometrical combinations (n_1=1400r/min)

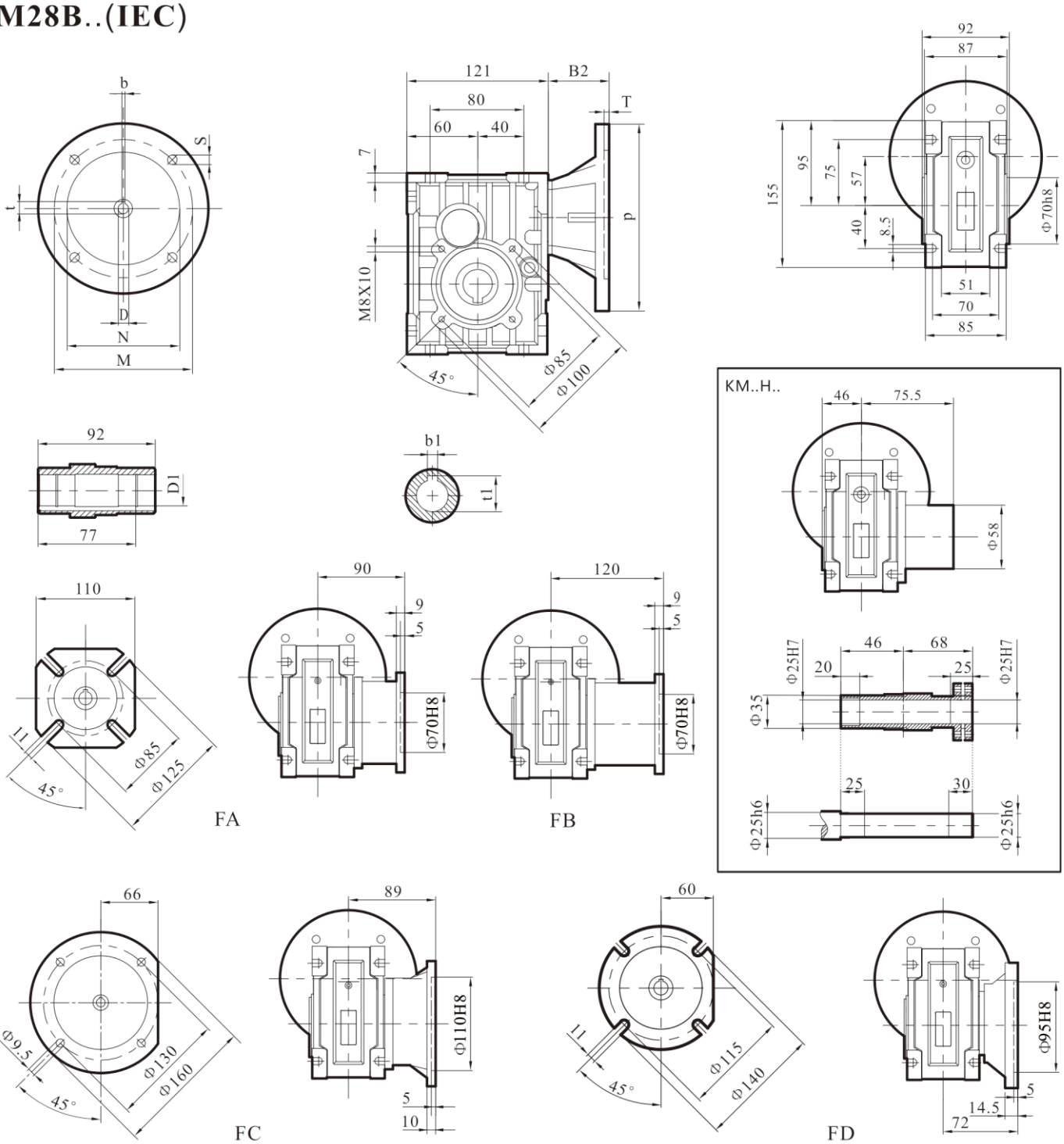
750Nm

减速机型号 Gear units	i 公称 Nomial	i 实际 Actual	n_2 [r/min]	M2max [Nm]	Fr_2 [N]	71B5 71B14	80B5 80B14	90B5 90B14	100B5 100B14	112B5 112B14	132B5
3级 / Stage											
KM68C	300	298.57	4.7	750	10000						
KM68C	250	250.10	5.6	750	10000						
KM68C	200	195.43	7.2	750	9740						
KM68C	150	156.07	9	750	9040						
KM68C	125	122.67	11.4	750	8340						
KM68C	100	97.96	14.3	650	7740						
KM68C	75	75.51	18.5	520	7090						
2级 / Stage											
KM68B	60	59.71	23	750	6560						
KM68B	50	50.02	28	750	6180						
KM68B	40	39.09	36	750	5690						
KM68B	30	31.21	45	750	5280						
KM68B	25	24.53	57	750	4870						
KM68B	20	19.59	71	650	4520						
KM68B	15	15.10	93	520	4150						
KM68B	12. 5	12.16	115	750	3860						
KM68B	10	9.71	144	650	3580						
KM68B	7. 5	7.48	187	520	3280						

外形尺寸图表 | OUTLINE DIMENSION SHEET

6.1 KM(IEC) 外形尺寸 / Outline Dimension

KM28B..(IEC)



IEC	De8	b	t	P	M	N	S	T	B2
63B5	11	4	12.8	140	115	95	9	4	45
71B5	14	5	16.3	160	130	110	9	4	52
71B14	14	5	16.3	105	85	70	7	4	52
80B5	19	6	21.8	200	165	130	11	4	72
80B14	19	6	21.8	120	100	80	7	4	72
90B5	24	8	27.3	200	165	130	11	4	72
90B14	24	8	27.3	140	115	95	9	4	72

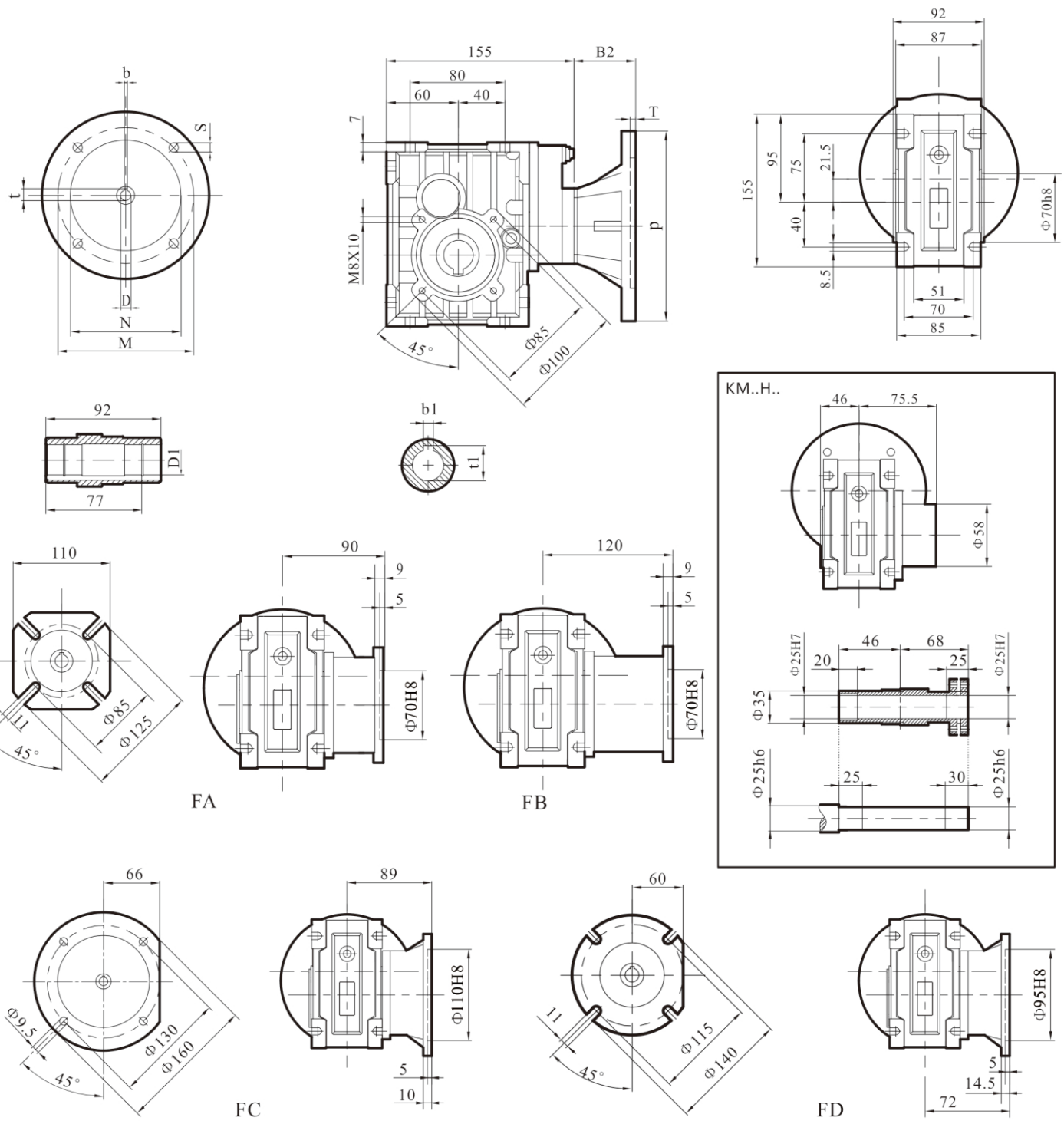
D1 H8	b1	t1
20*	6	22.8
24*	8	27.3
25	8	28.3

*非标孔，
订单时请说明。
*Only on request

KM	Kg (重量)
28B	4.2

不包括马达
Weight without motor

KM28C..(IEC)



IEC	De8	b	t	P	M	N	S	T	B2
63B5	11	4	12.8	140	115	95	9	4	45
71B5	14	5	16.3	160	130	110	9	4	52
71B14	14	5	16.3	105	85	70	7	4	52

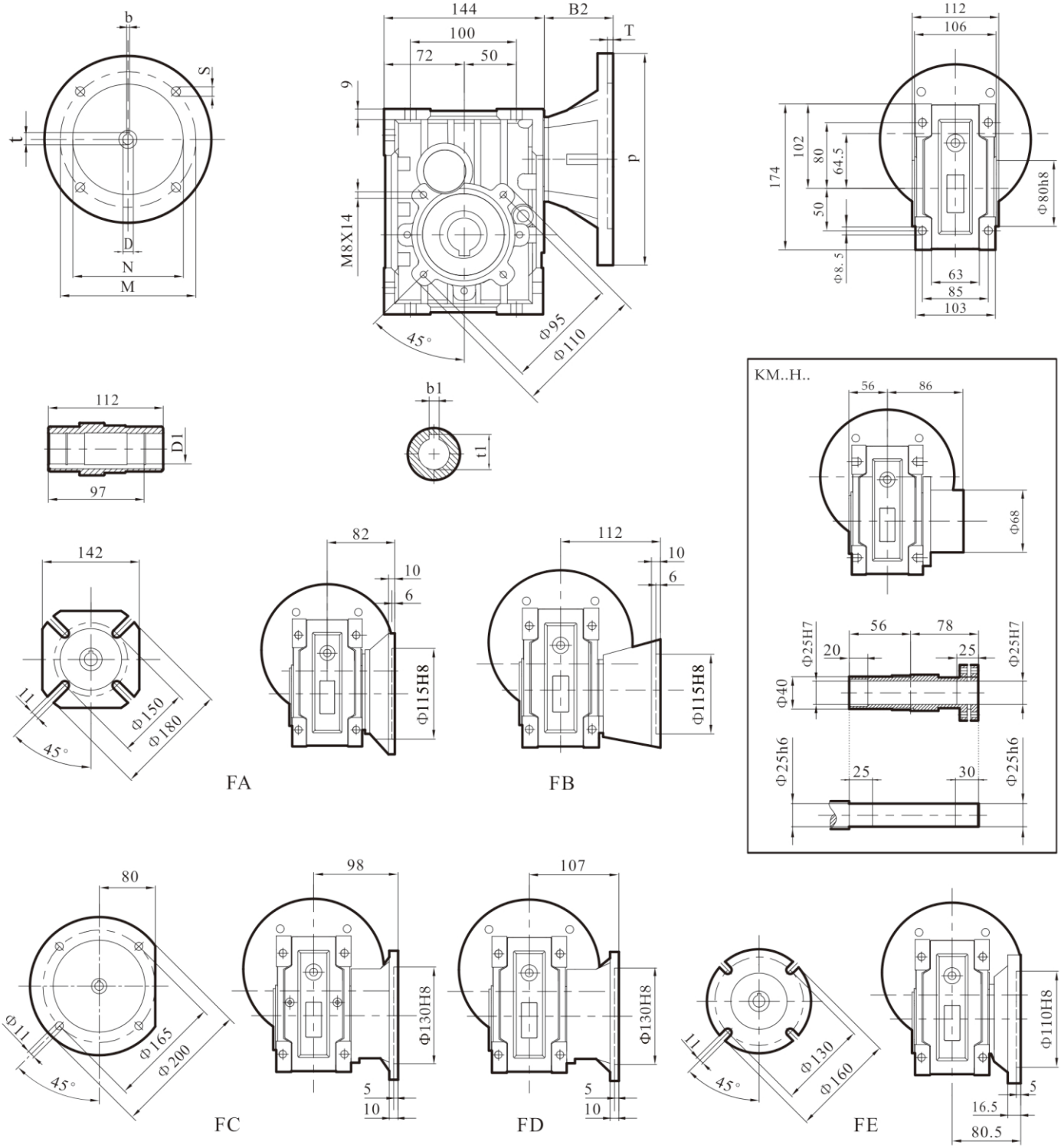
D1 H8	b1	t1
20*	6	22.8
24*	8	27.3
25	8	28.3

*非标孔，
订单时请说明。
*Only on request

KM	Kg (重量)
28C	5

不包括马达
Weight without motor

KM38B..(IEC)



IEC	De8	b	t	P	M	N	S	T	B2
63B5	11	4	12.8	140	115	95	9	4	45
71B5	14	5	16.3	160	130	110	9	4	52
71B14	14	5	16.3	105	85	70	7	4	52
80B5	19	6	21.8	200	165	130	11	4	72
80B14	19	6	21.8	120	100	80	7	4	72
90B5	24	8	27.3	200	165	130	11	4	72
90B14	24	8	27.3	140	115	95	9	4	72

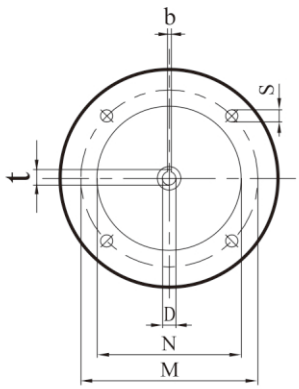
D1 H8	b1	t1
25	8	28.3
28*	8	31.3

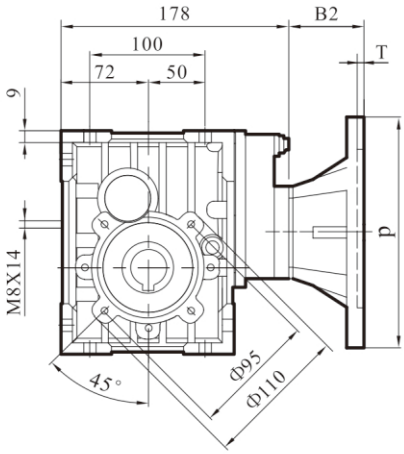
*非标孔，
订单时请说明。
*Only on request

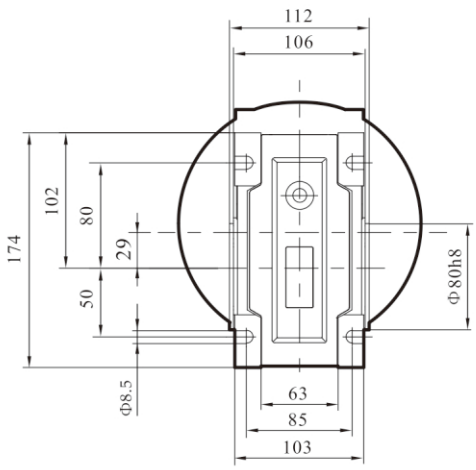
KM	Kg (重量)
38B	6.0

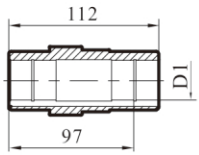
不包括马达
Weight without motor

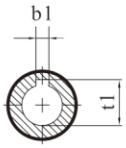
KM38C..(IEC)

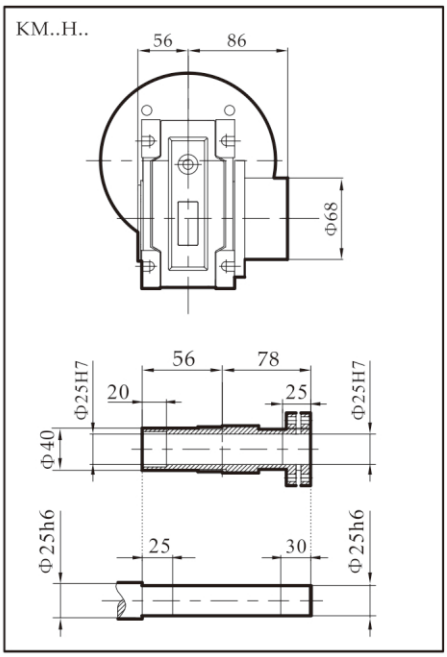


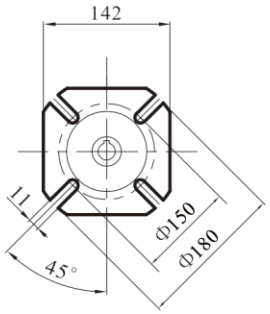




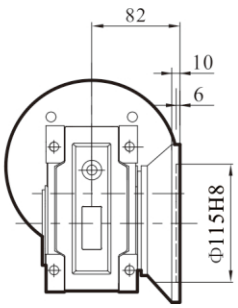


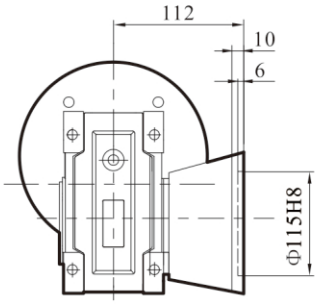




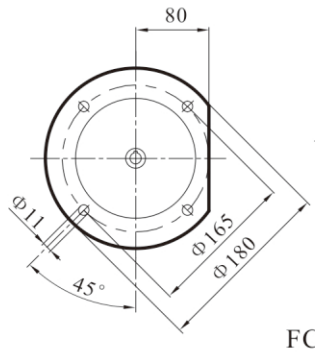


FA

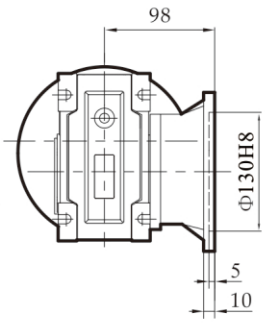


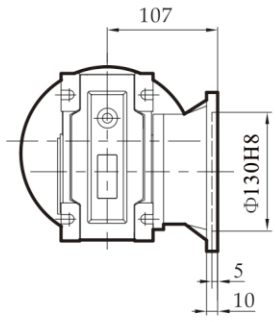


FB

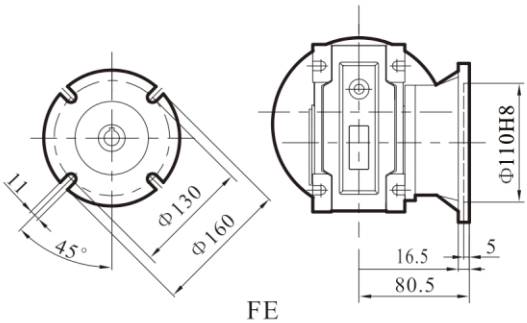


FC





FD



FE

IEC	De8	b	t	P	M	N	S	T	B2
63B5	11	4	12.8	140	115	95	9	4	45
71B5	14	5	16.3	160	130	110	9	4	52
71B14	14	5	16.3	105	85	70	7	4	52
80B5	19	6	21.8	200	165	130	11	4	72
80B14	19	6	21.8	120	100	80	7	4	72

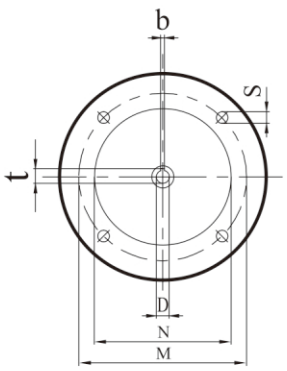
D1 H8	b1	t1
25	8	28.3
28*	8	31.3

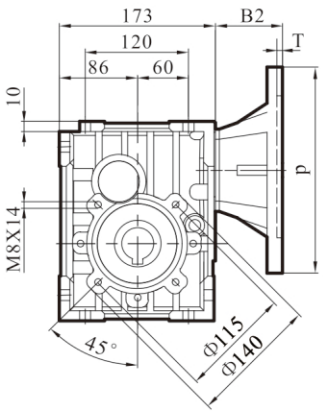
*非标孔，
订单时请说明。
*Only on request

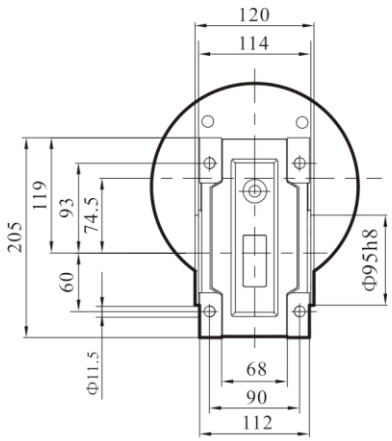
KM	Kg (重量)
38C	6.8

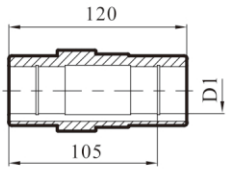
不包括马达
Weight without motor

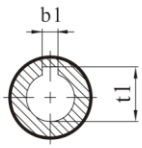
KM48B..(IEC)

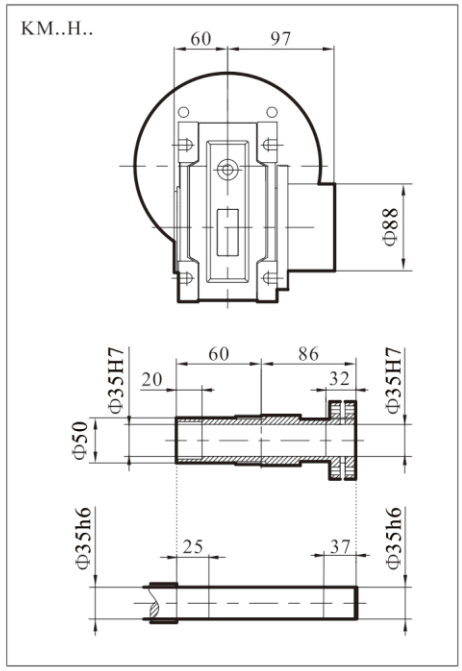


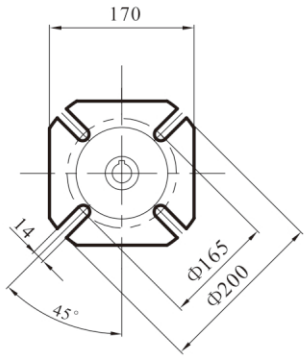


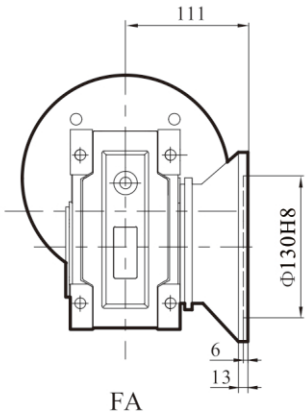












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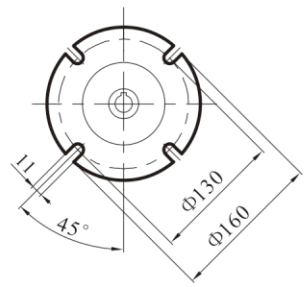
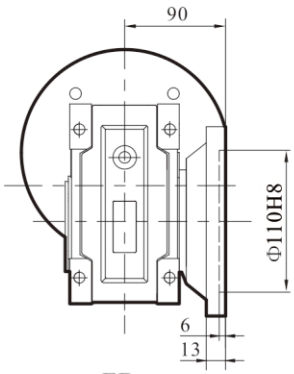




FB

IEC	De8	b	t	P	M	N	S	T	B2
71B5	14	5	16.3	160	130	110	9	4	59
80B5	19	6	21.8	200	165	130	11	4	79
80B14	19	6	21.8	120	100	80	7	4	79
90B5	24	8	27.3	200	165	130	11	4	79
90B14	24	8	27.3	140	115	95	9	4	79
100/112B5	28	8	31.3	250	215	180	13.5	4.5	89
100/112B14	28	8	31.3	160	130	110	9	4.5	89

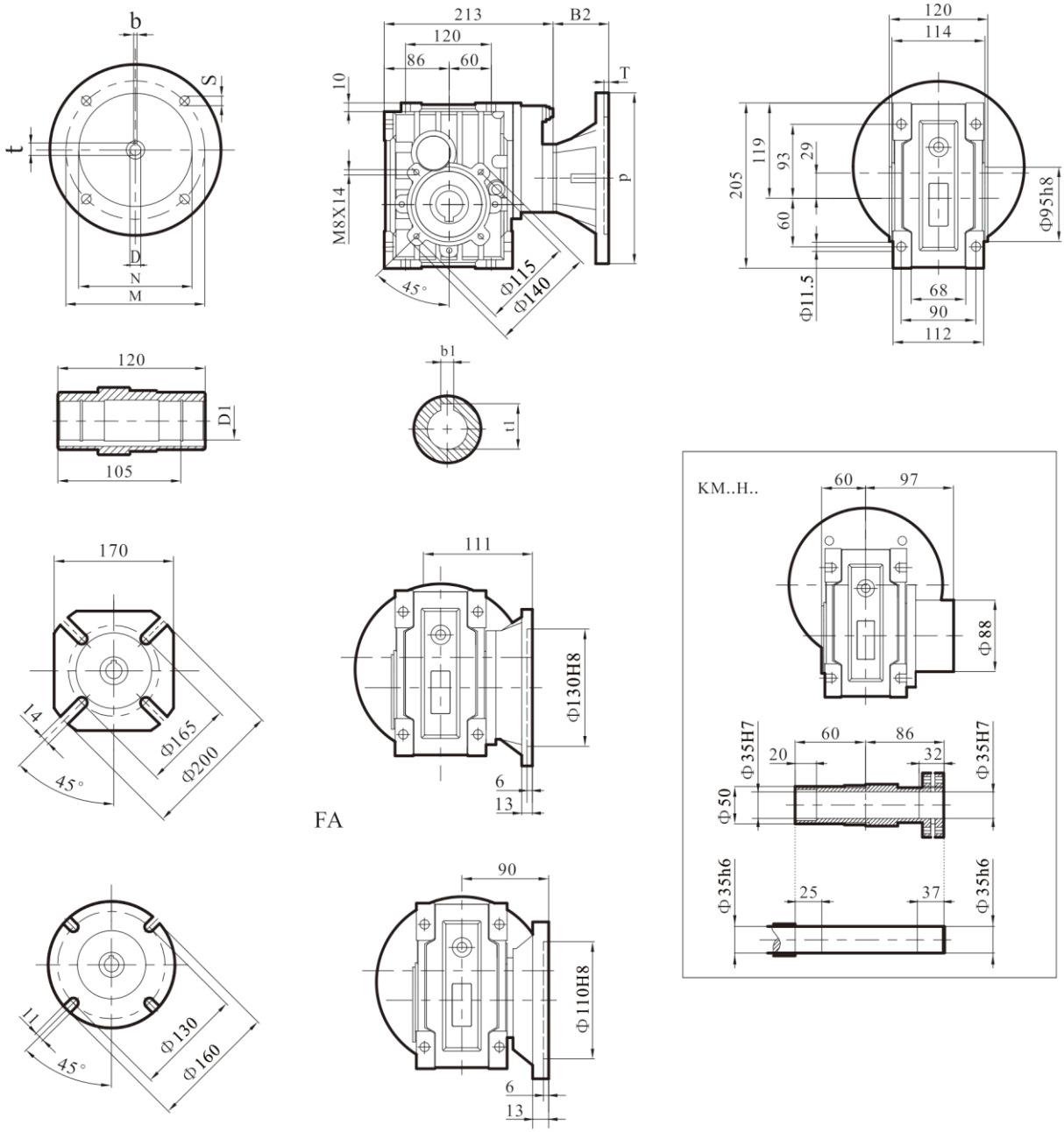
D1 H8	b1	t1
28	8	31.3
30*	8	33.3
35*	10	38.3

*非标孔，
订单时请说明。
*Only on request

KM	Kg (重量)
48B	9.2

不包括马达
Weight without motor

KM48C..(IEC)



IEC	De8	b	t	P	M	N	S	T	B2
63B5	11	4	12.8	140	115	95	9	4	52
71B5	14	5	16.3	160	130	110	9	4	59
80B5	19	6	21.8	200	165	130	11	4	79
80B14	19	6	21.8	120	100	80	7	4	79
90B5	24	8	27.3	200	165	130	11	4	79
90B14	24	8	27.3	140	115	95	9	4	79

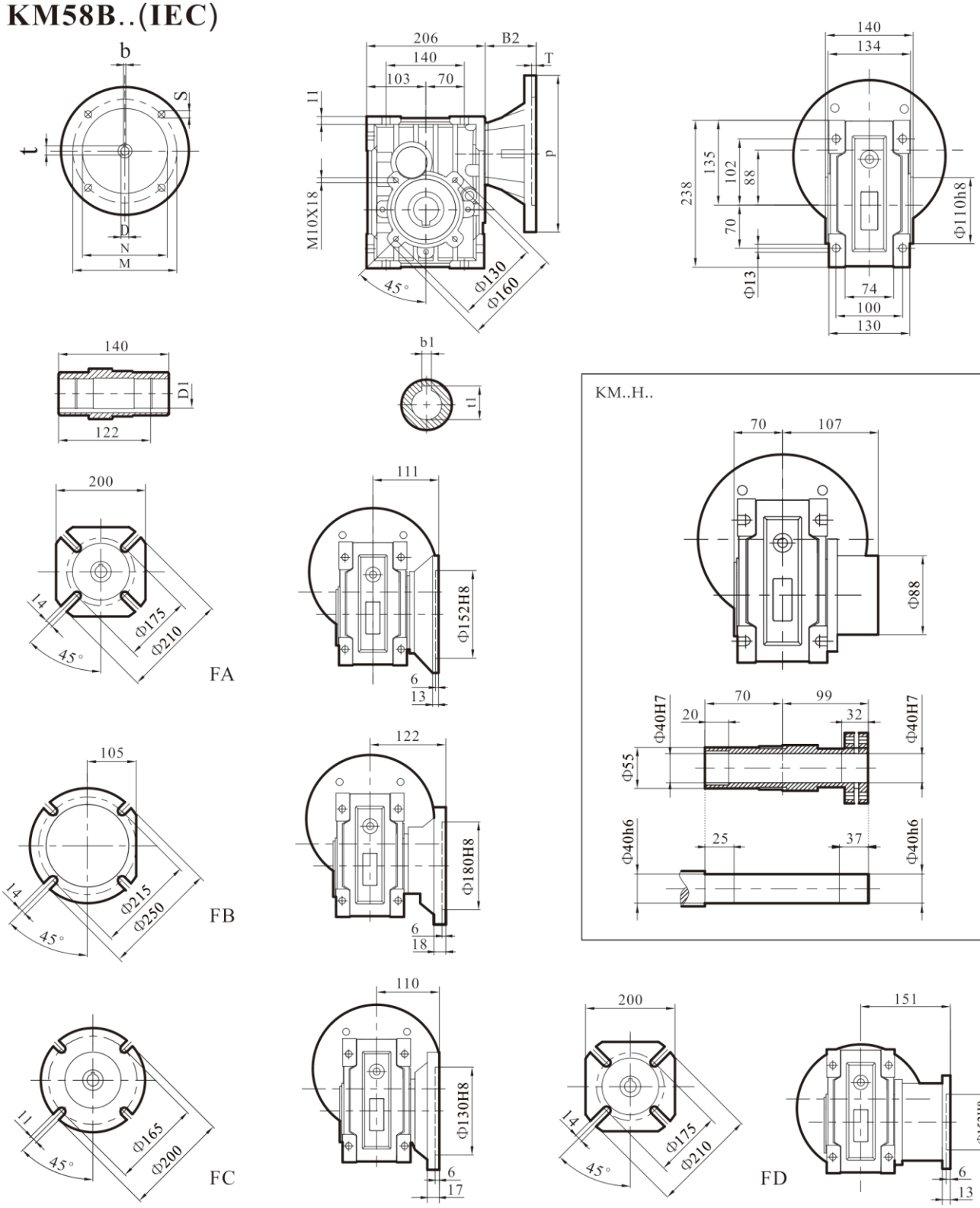
D1 H8	b1	t1
28	8	31.3
30*	8	33.3
35*	10	38.3

*非标孔，
订单时请说明。
*Only on request

KM	Kg (重量)
48C	10.8

不包括马达
Weight without motor

KM58B..(IEC)



IEC	De8	b	t	P	M	N	S	T	B2
71B5	14	5	16.3	160	130	110	9	4	59
80B5	19	6	21.8	200	165	130	11	4	79
80B14	19	6	21.8	120	100	80	7	4	79
90B5	24	8	27.3	200	165	130	11	4	79
90B14	24	8	27.3	140	115	95	9	4	79
100/112B5	28	8	31.3	250	215	180	13.5	4.5	89
100/112B14	28	8	31.3	160	130	110	9	4.5	89

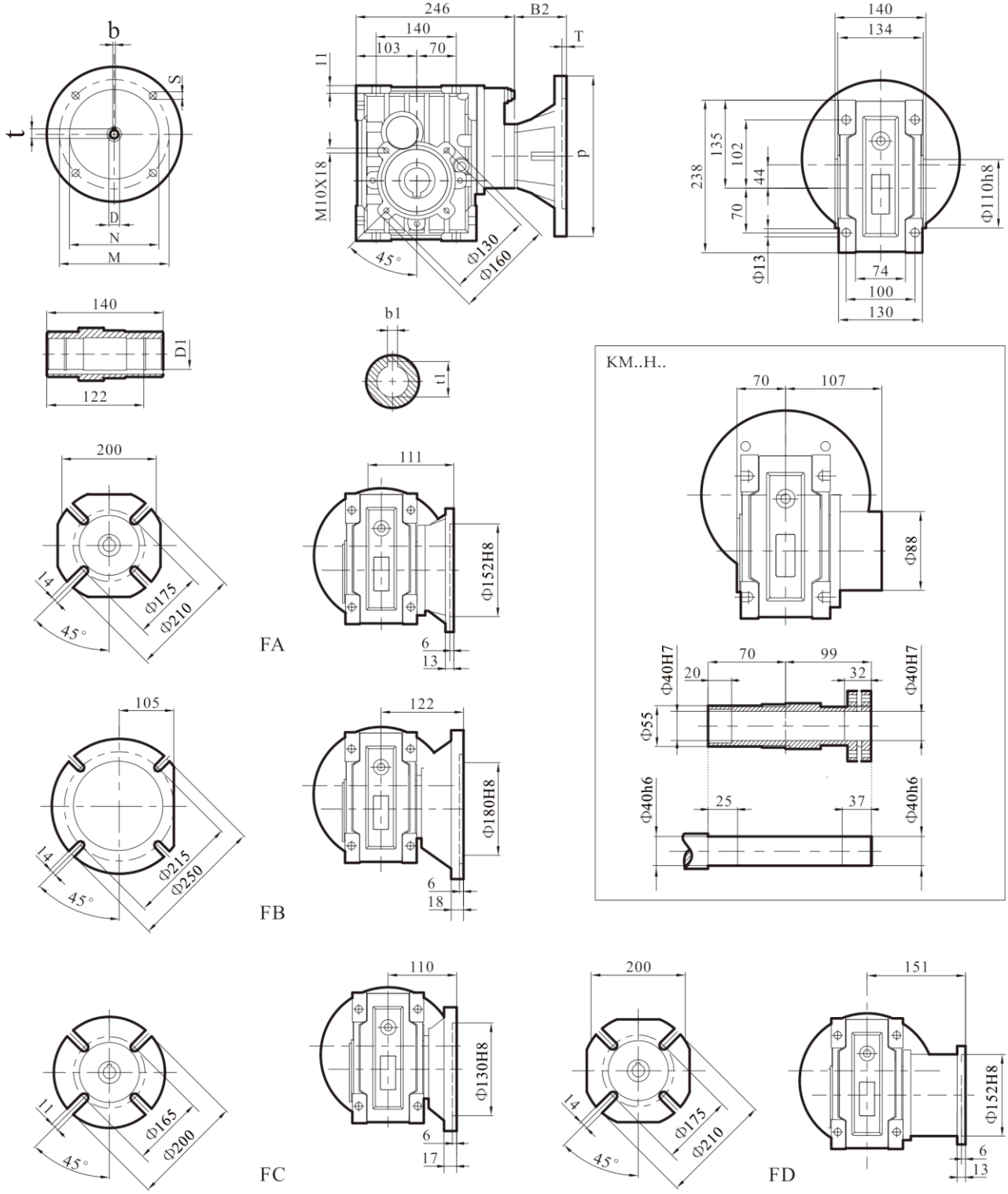
D1 H8	b1	t1
35	10	38.3
38*	10	41.3

*非标孔，
订单时请说明。
*Only on request

KM	Kg (重量)
58B	13.3

不包括马达
Weight without motor

KM58C..(IEC)



IEC	De8	b	t	P	M	N	S	T	B2
63B5	11	4	12.8	140	115	95	9	4	52
71B5	14	5	16.3	160	130	110	9	4	59
80B5	19	6	21.8	200	165	130	11	4	79
80B14	19	6	21.8	120	100	80	7	4	79
90B5	24	8	27.3	200	165	130	11	2	79
90B14	24	8	27.3	140	115	95	9	4	79

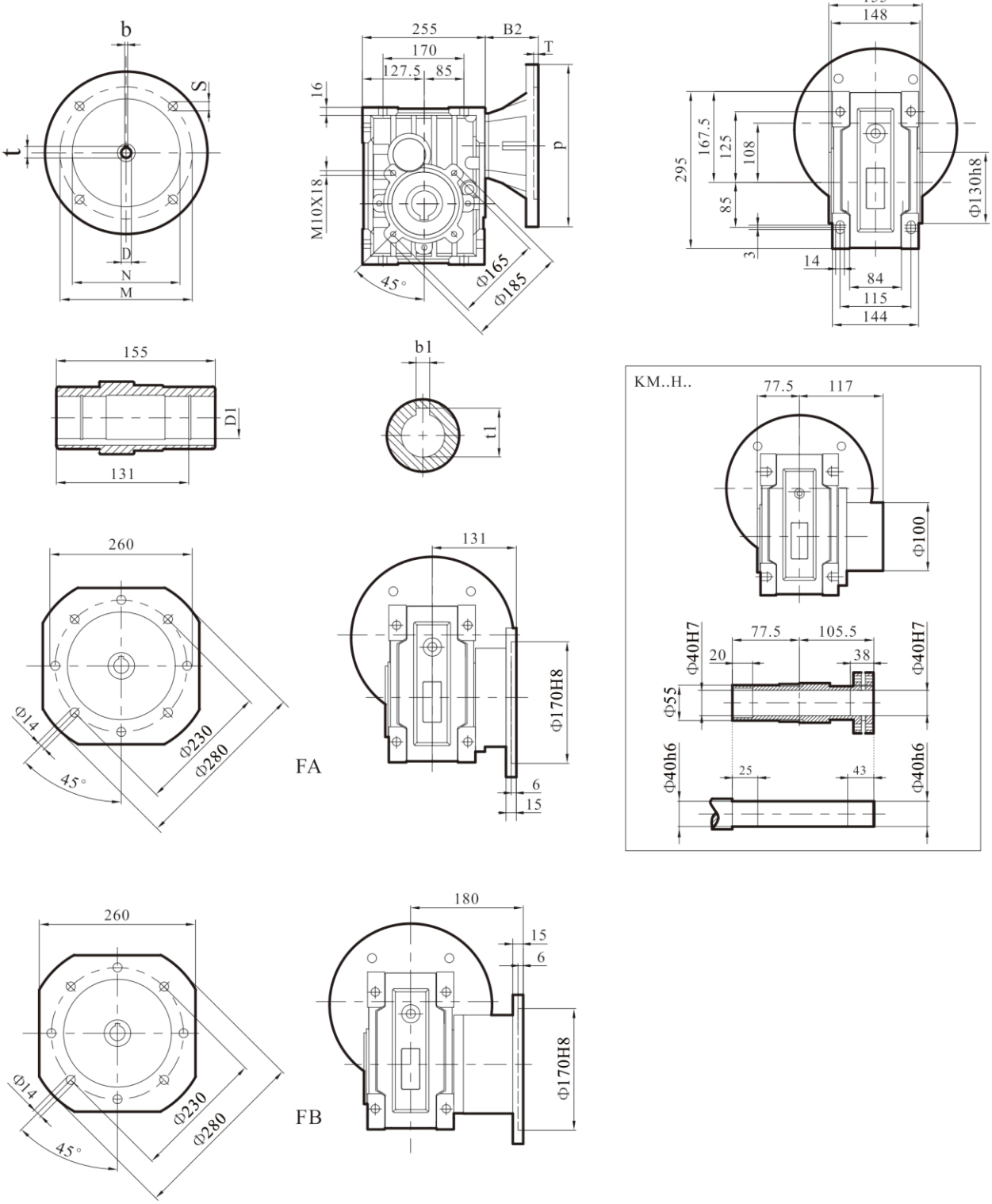
D1 H8	b1	t1
35	10	38.3
38*	10	41.3

*非标孔，
订单时请说明。
*Only on request

KM	Kg (重量)
58C	14.8

不包括马达
Weight without motor

KM68B..(IEC)



IEC	De8	b	t	P	M	N	S	T	B2
71B5	14	5	16.3	160	130	110	9	4	62
80B5	19	6	21.8	200	165	130	11	4	72
90B5	24	8	27.3	200	165	130	11	4	82
100/112B5	28	8	31.3	250	215	180	13.5	4.5	97
100/112B14	28	8	31.3	160	130	110	9	4.5	97
132B5	38	10	41.3	300	265	230	14	4.5	120

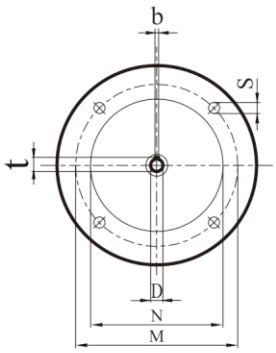
D1 H8	b1	t1
40*	12	43.3
42	12	45.3

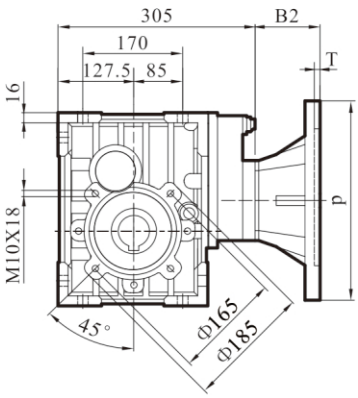
*非标孔，
订单时请说明。
*Only on request

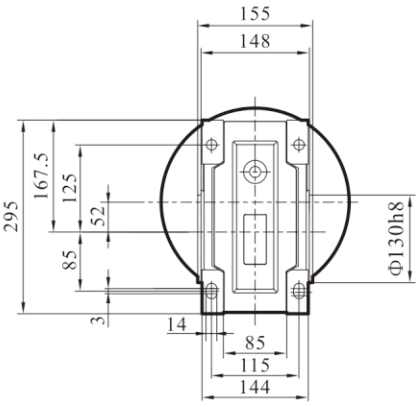
KM	Kg (重量)
68B	21.5

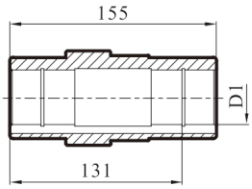
不包括马达
Weight without motor

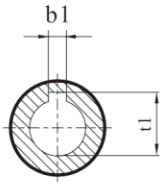
KM68C..(IEC)

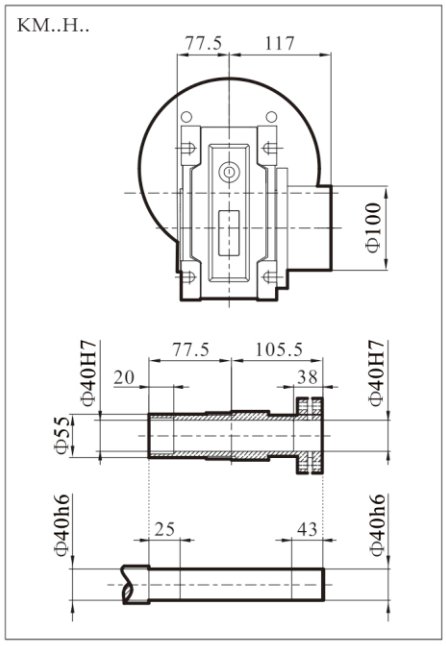


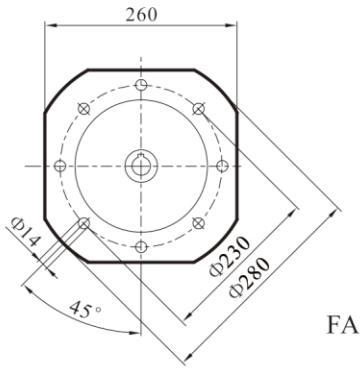




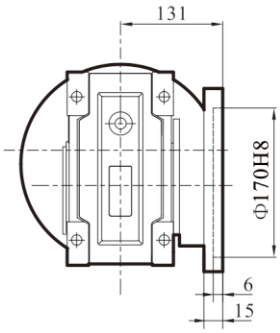


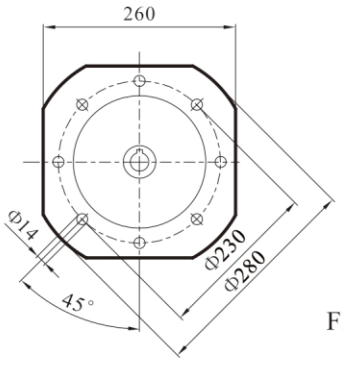




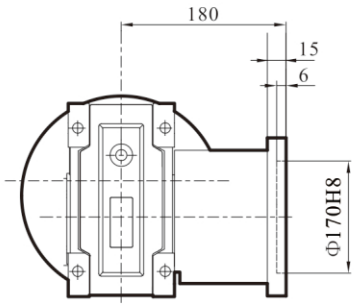


FA





FB



IEC	De8	b	t	P	M	N	S	T	B2
71B5	14	5	16.3	160	130	110	9	4	62
80B5	19	6	21.8	200	165	130	11	4	72
90B5	24	8	27.3	200	165	130	11	4	82
100B5	28	8	31.3	250	215	180	13.5	4.5	97
100B14	28	8	31.3	160	130	110	9	4.5	97

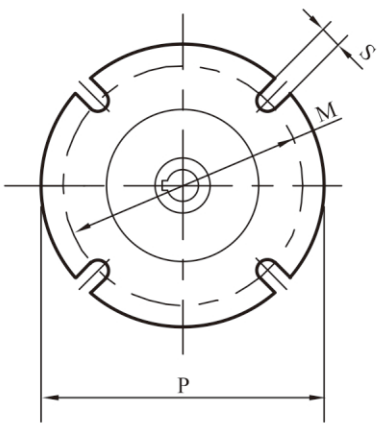
D1 H8	b1	t1
40*	12	43.3
42	12	45.3

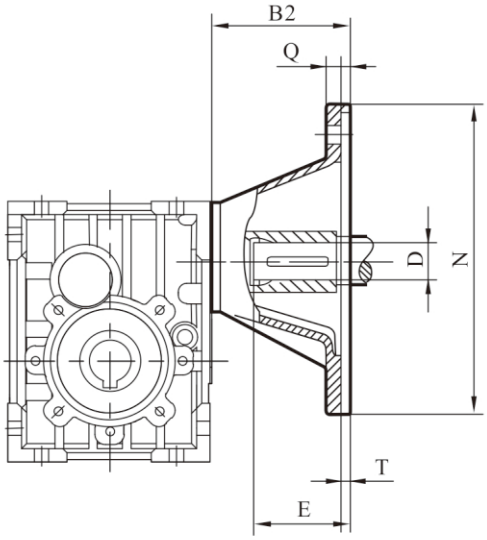
*非标孔，
订单时请说明。
*Only on request

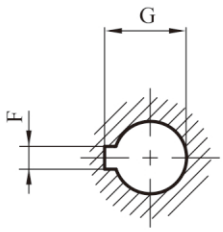
KM	Kg (重量)
68C	23.5

不包括马达
Weight without motor

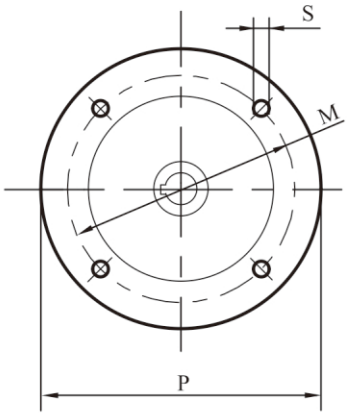
56C~145TC

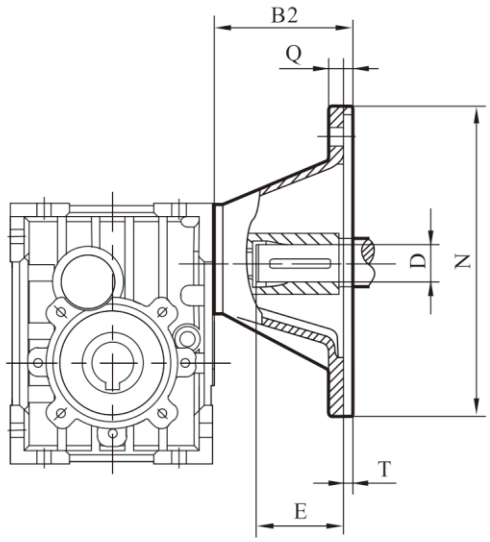


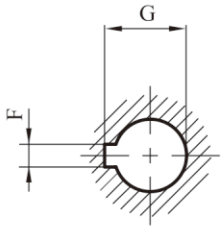




182TC~215TC





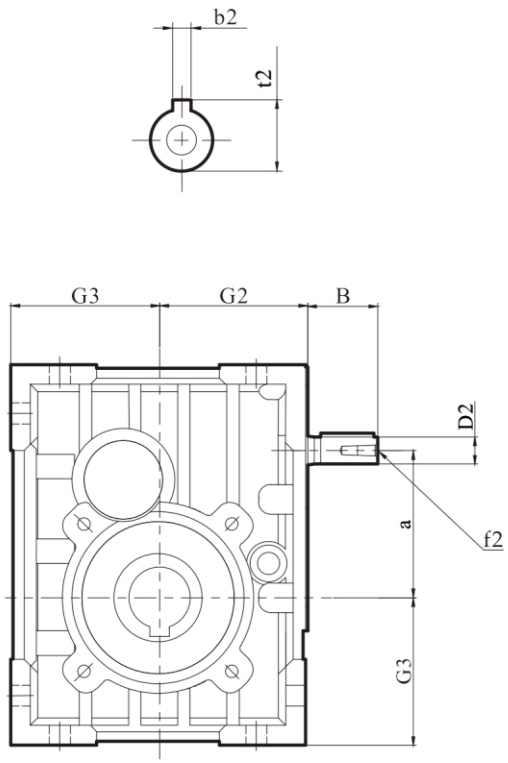


TYPE	NEMA Flange	B_2	D	E	F	G	M	N	P	Q	S	T
KM28	56C	2.953	0.625	2.06	0.188	0.713	5.875	4.50	6.50	0.433	0.413	0.177
KM38	56C	2.953	0.625	2.06	0.188	0.713	5.875	4.50	6.50	0.433	0.413	0.177
	143TC 145TC	2.953	0.875	2.12	0.188	0.963	5.875	4.50	6.50	0.433	0.413	0.177
KM48 KM58	56C	3.228	0.625	2.06	0.188	0.713	5.875	4.50	6.50	0.433	0.413	0.177
	143TC 145TC	3.228	0.875	2.12	0.188	0.963	5.875	4.50	6.50	0.433	0.413	0.177
	182TC 184TC	3.937	1.125	2.62	0.250	1.240	7.250	8.50	9.00	0.472	0.551	0.197
KM68	143TC 145TC	3.425	0.875	2.12	0.188	0.963	5.875	4.50	6.50	0.433	0.413	0.177
	182TC 184TC	4.134	1.125	2.62	0.250	1.240	7.250	8.50	9.00	0.472	0.551	0.197
	213TC 215TC	4.646	1.375	3.12	0.312	1.517	7.250	8.50	9.00	0.472	0.551	0.197

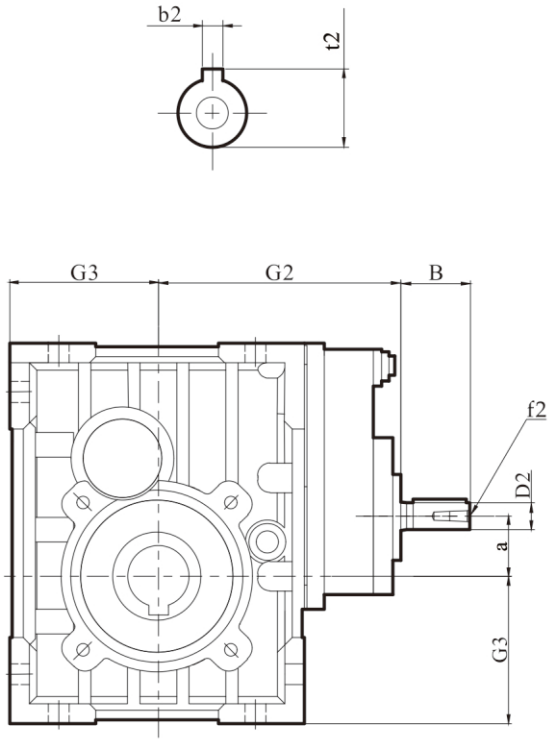
外形尺寸图表 | OUTLINE DIMENSION SHEET

6.2 KM..HS外形尺寸 / Outline Dimension

KM..B..HS



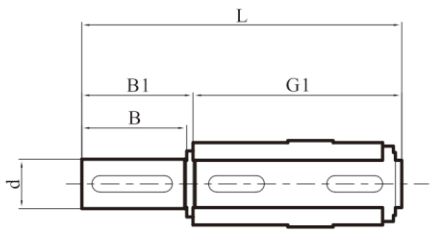
KM..C..HS

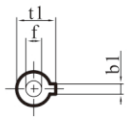


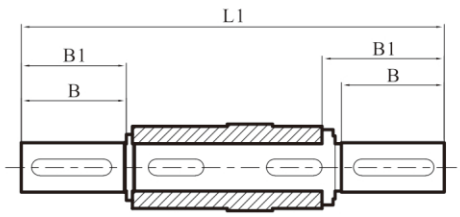
KM	B	D2 j6	G2	G3	a	b2	f2	t2
28B	23	11	65	60	57	4	-	12.5
28C	23	11	100	60	21.5	4	-	12.5
38B	30	14	76	72	64.5	5	M6	16
38C	23	11	111	72	29	4	-	12.5
48B	40	16	91	86	74.5	5	M6	18
48C	30	14	132	86	30.5	5	M6	16
58B	40	19	107	103	88	6	M6	21.5
58C	30	14	148	103	44	5	M6	16
68B	50	24	132	127.5	104	8	M8	27
68C	40	19	184	127.5	48	6	M6	21.5

附件尺寸图表 | ACCESSORIES OUTLINE DIMENSION SHEET

7.1 输出轴 / Output Shafts







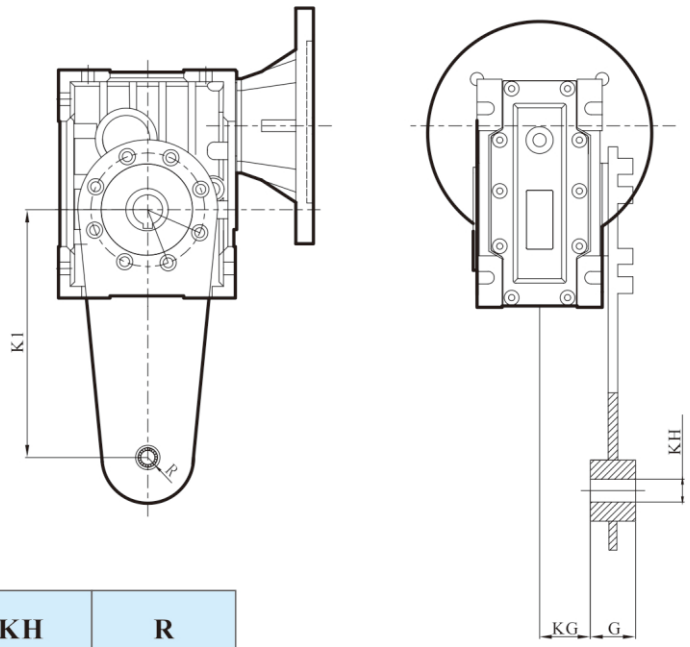
SS DS

KM	d h6	B	B1	G1	L	L1	f	b2	t1
28	24	50	53.5	92	153	199	M10x22	8	27
38	25	50	53.5	112	173	219	M10x22	8	28
48	28	60	63.5	120	192	247	M10x22	8	31
58	35	80	84.5	140	234	309	M12x28	10	38
68	42	80	84.5	155	249	324	M16x36	12	45

*非标产品，订单时请说明
*Only on request

7.2 扭力臂 / Torque Arm

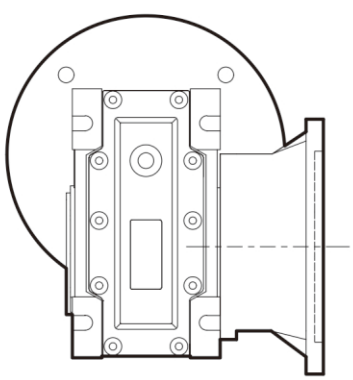
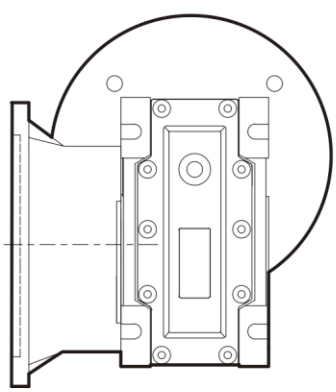
7.2.1 KM..扭力臂 / Torque Arm



KM	K1	G	KG	KH	R
28	100	14	38.5	10	18
38	150	14	49	10	18
48	200	25	47.5	20	30
58	200	25	57.5	20	30
68	250	30	62	25	35

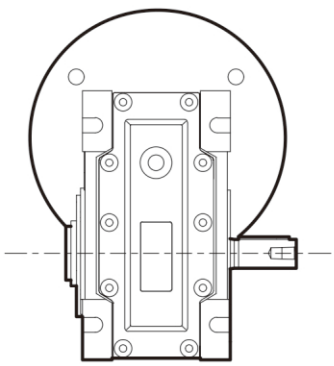
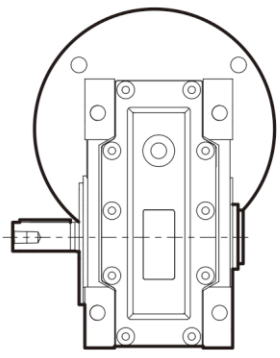
安装方位图 | INSTALLATION POSITIONS DIAGRAM

8.1 输出法兰位置 / Position diagram for output flange

FA1,FB1,FC1,FD1.FE1	FA2,FB2,FC2,FD2.FE2
	

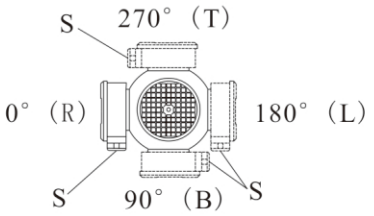
如没有特殊要求，一般按出厂的标准为准如图F..1方式和B3位置提供。
Unless specIfied otherwise, the gear units is supplied with the flange in pos ,F..1 referred topositionB3.

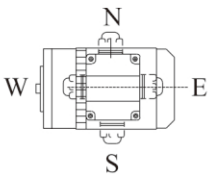
8.2 单向输出轴位置 / Position diagram for single output shaft

SS 1	SS 2
	

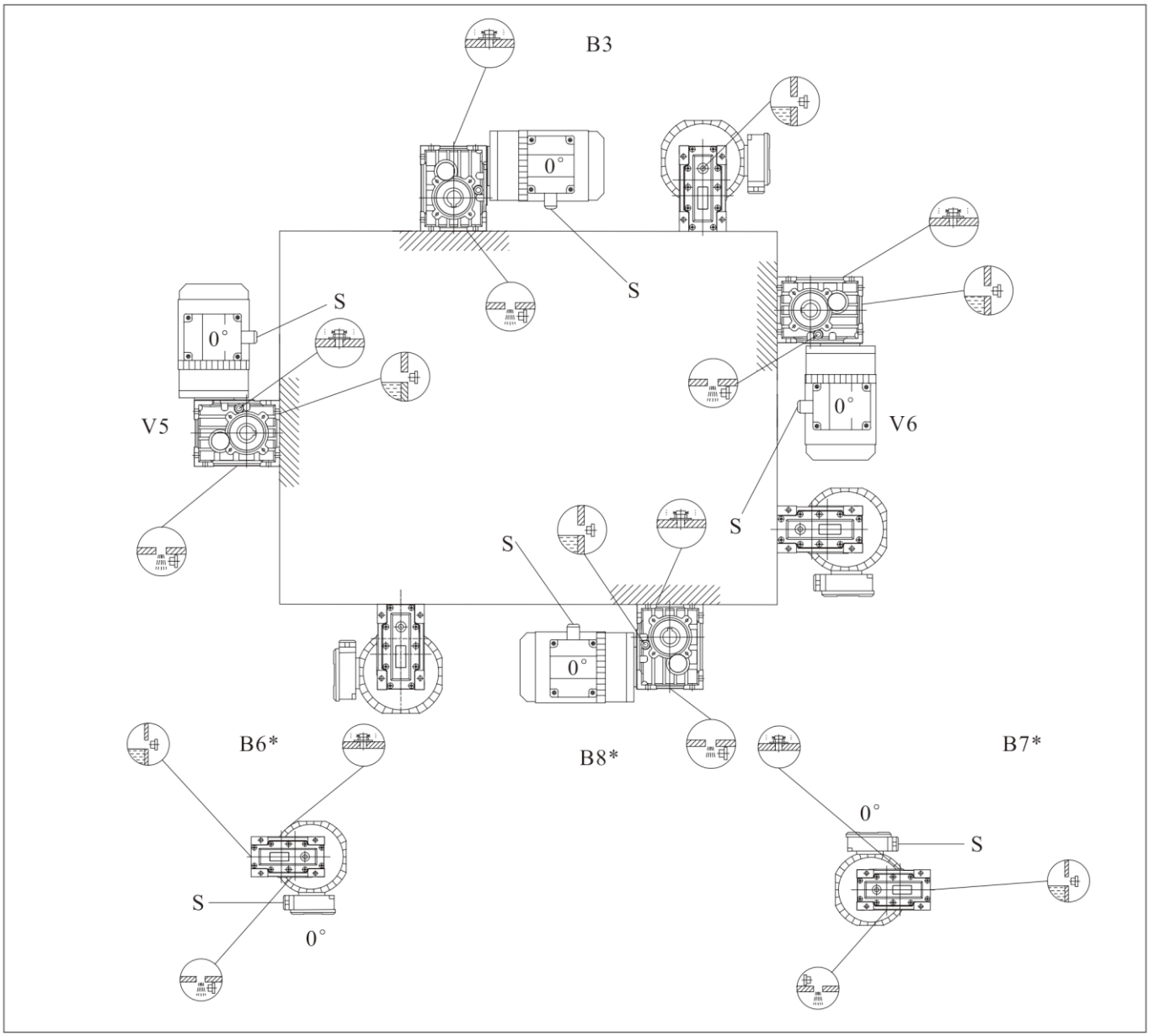
8.3 KM..安装方位 / Mounting Positions

符号 Symbol	含义 Meaning
	排气阀 Breather valve
	油位塞 Oil level plug
	放油塞 Oil drain plug



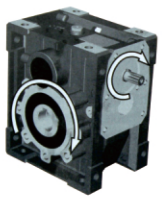


S：标准进线位置
Normal Position

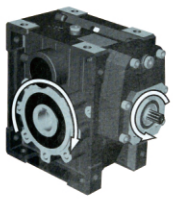


*：表示在此安装方式，不能仅凭油位塞加注润滑油，加注量按表内所示。
*：It means the lubricant can t be added according to the oil level line plug ,but also higher the fill quantity sa shown in the table

8.4 旋转方向 / Direction of rotation



KM..B



KM..C

减速机在使用时，电机可正反转输入使用；推荐使用左图所示输入轴旋转方向为准双曲面齿轮最佳啮合方向。

The motor can be run either CW or CCW while using with gearbox, the left chart is recommended.

润滑油 | LUBRICATON

9.1 润滑油型号 / Types of lubrication

	℃ -50 0 +50 +100	ISO	SHELL	Mobil MOBIL	BP	润滑油类型 lubrication type
KM..	标准 Stadard −10 +40	VG 220	Shell Omala S2 G220	Mobilgear 600 XP 220	BP Energol GR-XP 220	矿物油 Mineral oil
	−20 +25	VG 150 VG 100	Shell Omala S2 G100	Mobilgear 600 XP 100	BP Energol GR-XP 100	
	−30 +10	VG 68-46 VG 32	Shell Omala S2 V32	Mobil Excel™ 32		
	−40 +20	VG 22 VG 15	Shell Omala S2 V15	Mobil Excel™ 15	BP Energol HLP-HM 15	
	−40 +80	VG 220	Shell Omala S4 GX220	Mobil SHC 630		合成油 Synthetic oil
	−40 +40	VG 150	Shell Omala S4 GX150	Mobil SHC 629		
	−40 +10	VG 32	Shell Omala S4 ATF HDX	Mobil SHC 624		

9.2 润滑油加注量 Lubricant fill quantity

规定的加注量为参考值，精确值的变化与级数和传动比有关，请您在加注润滑油时一定要注意油位螺栓所指示的精确油量。后期调整安装方式时，您必须根据改变后的安装方式相应调整加注润滑剂，下表中列出了不同安装方式（B3.B6.B7）的减速器相应的标准参考润滑油注入量值。

The specified fill quantities are recom-mended values. The precise values vary depending on the number of stages and gear ratio. When filling, it is essential to check the oil level plug since it indicates the precise oil capac-ity. The following tables show guide values for lubricant fill quantities in relation to the mounting position (B3, B6,B7).

KM..润滑油加注量 / Lubrcant fill quantity

减速器型号 Gear units	加注量 Fill quantity in liters					单位:升(L)
	B3	B6	B7	B8	V5	V6
28B	0.22	0.20*	0.13*	0.15	0.25	0.14
28C#	0.07	0.04	0.04	0.05	0.08	0.09
38B	0.42	0.35*	0.24*	0.22	0.46	0.25
38C#	0.07	0.04	0.04	0.05	0.08	0.09
48B	0.70	0.58*	0.42*	0.42	0.75	0.45
48C#	0.13	0.09	0.09	0.09	0.15	0.17
58B	1.21	0.95*	0.72*	0.67	1.30	0.74
58C#	0.13	0.09	0.09	0.09	0.15	0.17
68B	2.15	1.70*	1.10*	1.25	2.20	1.20
68C#	0.25	0.17	0.17	0.20	0.32	0.36

维护 | MAINTENANCE

1.对于齿轮箱，首次换油必须在工作大约300小时（齿轮磨合期）后进行，在换油时应使用合适的清洗剂小心地冲洗齿轮箱，不得将矿物油和合成油混合。

2.每3000工作小时，最低程度半年，应检测油以及油位，油封密封不严引起滴漏的常规检测，若是IEC输入的减速器，则检测检查弹性体，必要时进行更换。

3.根据不同的工作条件（见下图）而定，最长每三年检测一次，更换矿物油，更换轴承润滑油脂。

4.根据不同的工作条件而定，更换输出轴上的油封。

5.产品出现故障时，不要拆卸部件，与本公司售后服务部门联系（需提供减速器规格、出厂日期、编号、已使用时间、主机名称、主机生产单位和故障类型）后，再采取合理的措施。

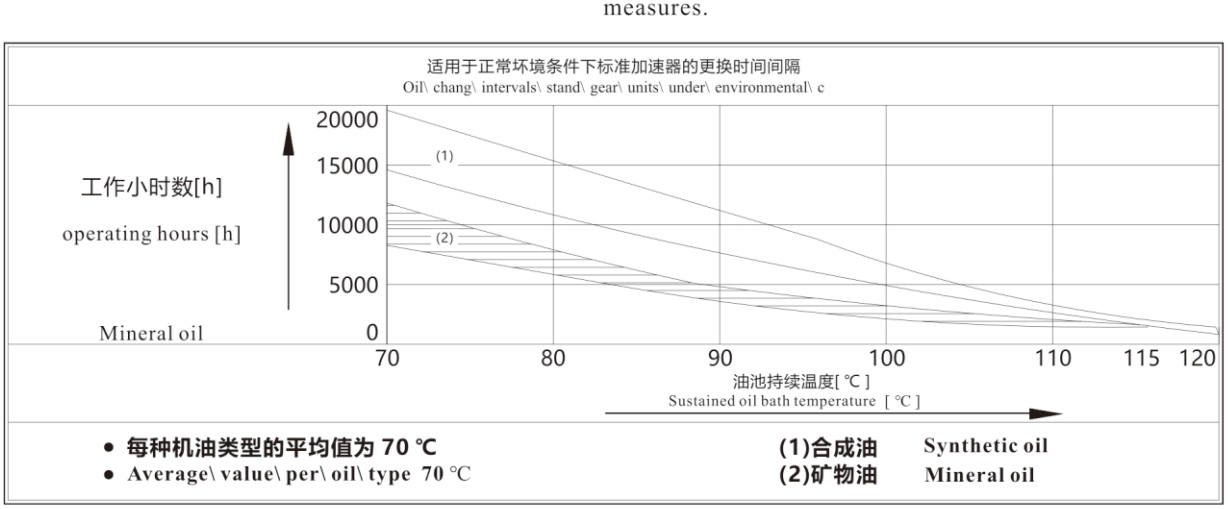
1). For gear units, first oil change should be after about 300 hours (run-in period). The right lotion is required to clean the gear units with care. Never mix the synthetic oil and mineral oil together.

2). Every 3000 working time, at least every 6 months, you have to check the oil and oil level, the seals visually for leakage. For IEC input gear units, the elastomer should be tested or replaced if neces-sary.

3). Depending on the operating conditions (see chart below), every 3 years at the latest for inspec-tion is needed. Then change the mineral oil and replace the bearing grease.

4). Depending on the operating conditions, change the oil seals on output shaft.

5). Once the malfunctions appear, stop disas-sembling the parts, and firstly please contact the customer service （the information about specifica-tion, delivery date, series number, time used, name of machine, machine manufacturer, malfunction problems is required) , then take the reasonable measures.

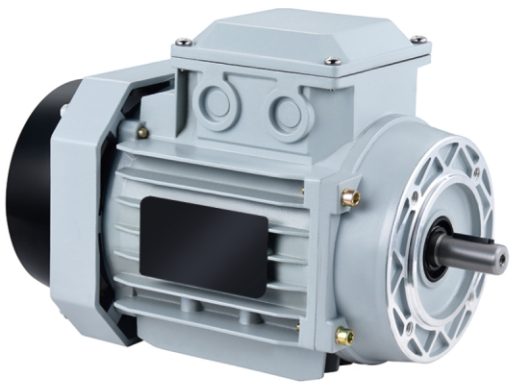


YS系列铝壳三相异步电动机 YS SERIES ALUMINUM SHELL THREE-PHASE ASYNCHRONOUS MOTOR

特点说明 / Feature description

YS系列铝壳三相异步电动机，符合国际电工协会（IEC）有关规定，选用优质原材料，进行最新式整体设计，具有性能好、噪声低、振动小、运行安全可靠、外型美观、体积小、重量轻、结构简单、维修方便等优点。

YS系列电动机适用于各类电机设备上。



YS series aluminum shell three-phase asynchronous motors comply with the relevant regulations of the International Electrotechnical Commission (IEC), select high-quality raw materials, and carry out the latest overall design, with good performance, low noise, small vibration, safe and reliable operation, beautiful appearance, small size, Light weight, simple structure, easy maintenance and other advantages.

YS series motors are suitable for all kinds of motor equipment.

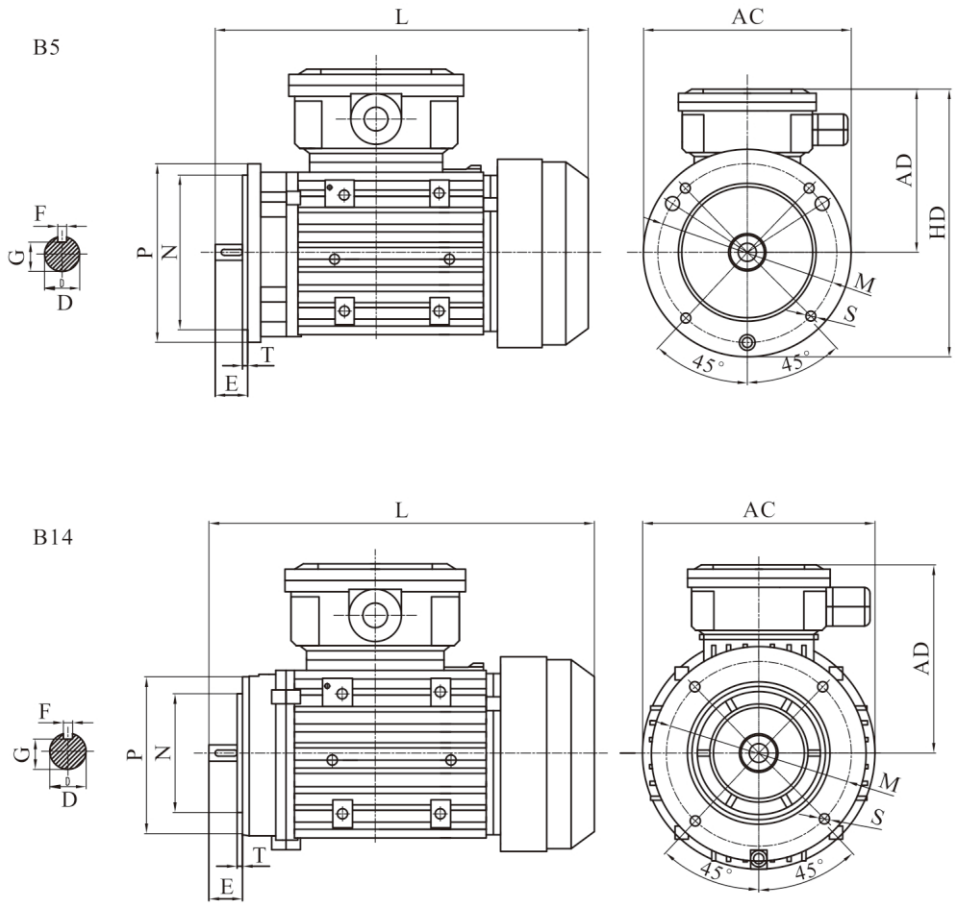
使用条件 / Conditions of use

环境气温度：-15℃≤0≤40℃	Ambient gas temperature: -15℃ ≤ 0 ≤ 40℃
海拔：不超过1000米	Altitude: no more than 1000 meters
额定电压：380V，可选用220V-760V	Rated voltage: 380V, optional 220V-760V
额定频率：50HZ/60HZ	Rated frequency: 50HZ/60HZ
绝缘等级：B/F/H级	Insulation class: B/F/H
防护等级：IP54、IP55	Protection level: IP54\IP55
冷却方式：Ic0141	Cold section method: Ic0141

技术参数 / Technical parameter

型号 Model	功率 KW	电流 (A)	功率因素	效率 (%)	转速 (r/min)	堵转转矩 额定转矩 Tst/Tn	堵转电流 额定电流 Lst/In	最大转距 额定转距 Tmax/Tn	净 重 N.W.(KG)	QTY/20	包装尺寸（MM）
同步转速 Synchronous speed1500r/min(380V/50HZ)											
GS561-4	0.06	0.23	0.70	56	1300	2.1	4.0	2.0	3.6	6000	220×120×165
GS562-4	0.09	0.33	0.72	58	1300	2.1	4.0	2.0	4	5000	220×120×165
GS631-4	0.12	0.44	0.72	57	1330	2.2	4.4	2.1	4	4400	260×150×165
GS632-4	0.18	0.62	0.73	60	1330	2.2	4.4	2.1	4.5	4400	260×150×165
GS711-4	0.25	0.79	0.74	65	1360	2.2	5.2	2.1	5.6	3000	285×170×160
GS712-4	0.37	1.12	0.75	67	1360	2.2	5.2	2.1	6	3000	285×170×160
GS801-4	0.55	1.52	0.75	71	1380	2.3	5.2	2.4	9	2200	320×190×215
GS802-4	0.75	1.95	0.76	79.6	1380	2.3	6.0	2.3	10	2200	320×190×230
GS90S-4	1.10	2.85	0.77	81.4	1390	2.3	6.0	2.3	12	1500	375×210×230
GS90L-4	1.50	3.72	0.78	82.8	1390	2.3	6.0	2.3	13.2	1500	375×210×235
GS100L1-4	2.20	5.09	0.81	84.3	1410	2.3	7.0	2.3	21	960	400×225×320
GS100L2-4	3.00	6.78	0.82	85.5	1410	2.3	7.0	2.3	24.8	950	400×225×320
GS112M-4	4.00	8.80	0.82	88.6	1435	2.3	7.0	2.3	29	700	420×255×290
GS132S1-4	5.50	11.70	0.83	87.7	1445	2.3	7.0	2.3	44	460	510×345×375
GS132S2-4	7.50	15.60	0.84	88.7	1445	2.3	7.0	2.3	54	450	520×345×375
GS160M-4	11.00	22.50	0.84	89.8	1460	2.2	7.0	2.3	62	/	615×420×330
GS160L-4	15.00	30.00	0.85	90.6	1460	2.2	7.5	2.3	66	/	670×420×330

安装方位图 / Installation orientation



安装尺寸及外形尺寸 / Installation dimensions and external dimensions

机座号	安装尺寸									INSTALLATION SIZE FOR B14					INSTALLATION SIZE FOR B5					外形尺寸				
	A	B	C	D	E	F	G	H	K	M	N	P	S	T	M	N	P	S	T	AB	AC	AD	HD	L
56M	90	71	36	9	20	3	7.2	56	5.8	65	50	80	M5	2.5	100	80	120	7	3.0	112	115	90	146	198
63M	100	80	40	11	23	4	8.5	63	7	75	60	90	M5	2.5	115	95	140	10	3.0	120	127	95	158	225
71M	112	90	45	14	30	5	11	71	7	85	70	105	M6	2.5	130	110	160	10	3.5	135	145	105	176	255
80M	125	100	50	19	40	6	15.5	80	10	100	80	120	M6	3.0	165	130	200	12	3.5	155	165	115	195	295
90S	140	100	56	24	50	8	20	90	10	115	95	140	M8	3.0	165	130	200	12	3.5	175	180	120	210	331
90L	140	125	56	24	50	8	20	90	10	115	95	140	M8	3.0	165	130	200	12	3.5	175	180	120	210	361
100L	160	140	63	28	60	8	24	100	12	130	110	160	M8	3.5	215	180	250	15	4.0	200	200	155	255	392
112M	190	140	70	28	60	8	24	112	12	130	110	160	M8	3.5	215	180	250	15	4.0	230	222	180	274	406
132S	216	140	89	38	80	10	33	132	12	165	130	200	M10	4.0	265	230	300	15	4.0	260	260	200	314	473
132M	216	178	89	38	80	10	33	132	12	165	130	200	M10	4.0	265	230	300	15	4.0	260	260	200	314	505
160M	254	210	108	42	110	12	37	160	14.5	265	230	300	M12	4.0	300	250	350	18.5	5.0	304	315	242	399.5	609
160L	254	254	108	42	110	12	37	160	14.5	265	230	300	M12	4.0	300	250	350	18.5	5.0	304	315	242	399.5	653