L series

转向减速机

Right angle shaft gear reducers

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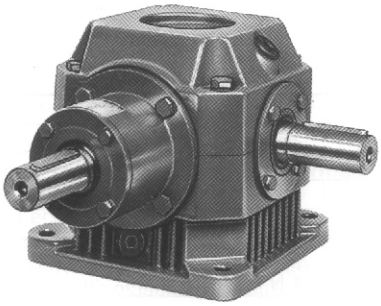
注：
本手册中,力矩单位为daNm,1daNm=10Nm;

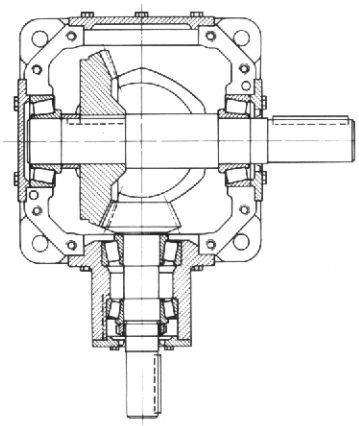
NOTE:
The unit of torque in this catalogue is daNm,1daNm=10Nm;

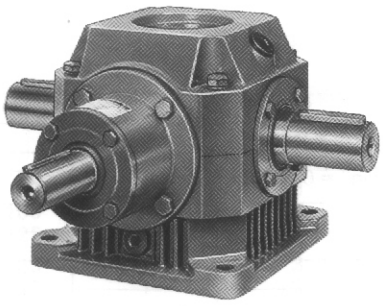
转向减速器

Right angle shaft gear reducers

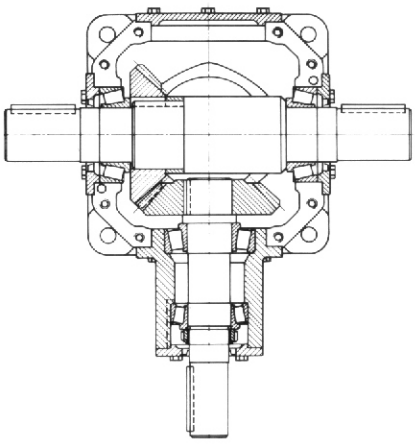


标准低速轴
standard low speed shaft

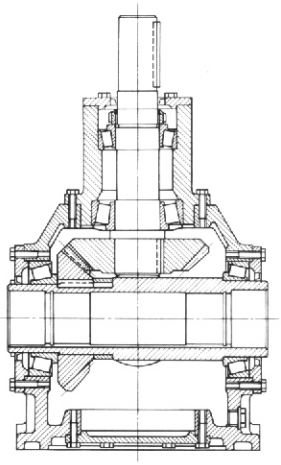


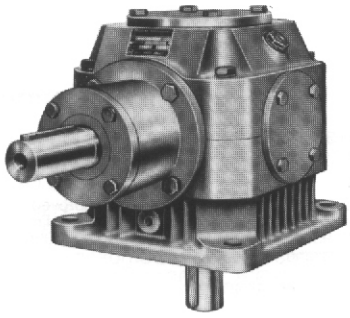


加粗低速轴
oversized low speed shaft

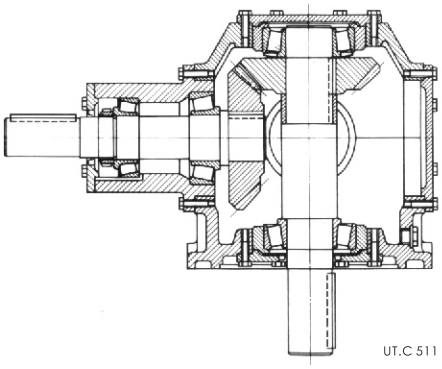


空心低速轴
hollow low speed shaft





标准低速轴
standard low speed shaft



1 – 相关符号及量度单位

用在手册和公式中的符号（按字母顺序排列）,以及所用量度单位

1 – Symbols and units of measure

Symbols used in the catalogue and formulae, in alphabetical order, with relevant units of measure.

符号 Symbol	定义 Definition		量度单位 Units of measure 手册中的 In the catalogue	公式中的 In the formule Technical System	SI System	注 Notes
	尺寸	dimensions	mm	–		
a	加速度	acceleration	–	m/s^2		
d	直径	diameter	–	m		
f	频率	frequency	Hz	Hz		
fs	服务系数	service factor				
ft	热功率系数	thermal factor				
F	力	force	–	kgf	N[2)]	1 kgf≈9,81N
F_r	径向载荷	radial load	kN	–		
F_a	轴向载荷	axial load	kN	–		
g	重力加速度	acceleration fo gravity	–	m/s^2		额定值/ normal value 9,81 m/s^2
G	重力	weight(weight force)	–	kgf	N	
Gd^2	动量	dynamic moment	–	kgf m^2	–	
i	减速比	transmission ratio				$i=\frac{n_1}{n_2}$
I	电流	electric current	–	–	A	kg m^2
J	惯量	moment of inertia	kg m^2			
L_n	轴承寿命	bearing life	h	Kgf s^2/m	–	kg[3)]
m	质量	mass	kg	kgf m		Nm
M	扭矩	torque	kNm			1 kgf m≈9.81 Nm
n	速度	speed	Min^{-1}	转/分钟 rev/min	–	1 min^{-1}≈0.105 rad/s
P	功率	power	KW	CV	W	1 CV≈736W≈0.736KW
Pt	热功率	thermal power	kW	–		
r	半径	radius	–	m		
R	可变速比	variation ratio				$R=\frac{n_{2\,max}}{n_{2\,min}}$
s	距离	distance	–	m		
t	摄氏温度	celsius temperature	℃	–		
t	时间	time	s min h d	s		1 min =60 s 1 h= 60 min = 3 600 s 1d = 24h= 86 400s
U	电压	voltage	V	V		
v	速度	velocity	–	m/s		
W	功	work, energy	MJ	kgf m	J[4)]	
z	启动频率	frequency of starting	avv./h starts/h	–		
α	角加速度	angular acceleration	–	rad/s^2		
η	效率	efficiency				
η_s	静效率	static efficiency				
μ	摩擦系数	friction coefficient				
Φ	角度	plane angle	°	rad		1 圆周 = 2 π rad　1 rev = 2 π rad $1° = \frac{\pi}{180}$ rad
ω	角速度	angular velocity	–	–	rad/s	1 rad/s≈9,55 min^{-1}

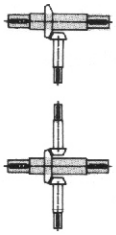
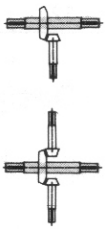
附加符号　　Additional indexes and other signs

max	最大的	maximum
min	最小的	minimum
N	额定的	nominal
1	输入有关的	relating to high speed shaft (input)
2	输出有关的	relating to low speed shaft (output)
÷	到	from ... to
≈	大约等于	approximately equal to
⩾	不小于	greater than or equal to
⩽	不大于	less than or equal to

2 – 产品说明

主要结构特点

– 现代的模块化结构,尺寸标准化;
– 总体尺寸小（由于我们的齿轮硬化后承载能力强）;
– 可以使用法兰或地脚固定
– 可以提供成直角的输入输出轴位置，输入输出轴均可以制成水平或竖直方向，可以提供双伸得输出轴;
– 使用锥滚子轴承;
– 可以提供**标准、加粗或空心输出**轴,(下表中数字为轴形式代号),可以满足紧凑和经 济的复合驱动要求(见第9页)

规格	轴类型 $i \leq 2$ 标准轴	$i \leq 2$ 加粗输出轴	$i \leq 2$ 空心轴	$i \geq 2.5$ 标准轴
				
	–			
	UT.C 504			
80	1	3	4	1
100	1	3	4	1
125	1	3	4	1
160	1	3	4	1
200	1	3	4	1
250	–	3	4	2
320	–	3	4	2

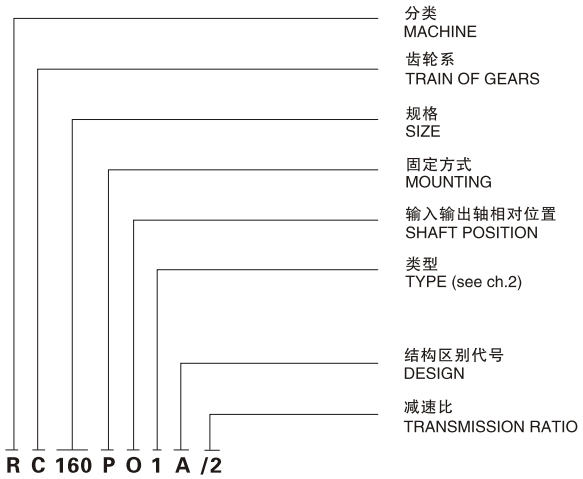
– 钢制轴端：标准或加粗输出轴，轴端带键槽，轴头有螺纹孔；空心输出轴内带有键槽和卡圈槽，可用于拆卸实心轴(规格125...320)
– 规格 80...125 的减速机，供机时已经注有合成润滑油，可保证**终身润滑**， 减速机无注油口；规格 160...320的 减速机，为油浴式润油，加油口带有透气阀;
– 自然或强制冷却(见12节);
– 箱体材料为球墨铸铁200，UNI ISO185;
– 油漆: 颜色为RAL5010 DIN1843，蓝色;

齿轮系

– 1对伞齿副由1个大伞齿轮和1或2个小伞齿轮组成;
– 齿轮均过渗碳硬化和表面硬化，材料为合金钢 16 CrNi4 或 20 MnCr5和18 NiCr Mo5（根据规格不同选用）UNI 7846–78;
– 格里森螺旋伞齿，齿面经研磨。

3 – 型号标记说明

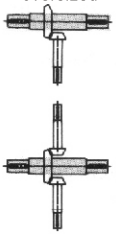
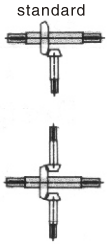
转向减速机标号含义如下



2 – Specificaltions

Main structural features

– Present–day modular construction; standardized dimensions;
– Reduced overall dimensions (thanks to casehardened and hard–ened gear pairs);
– Foot or flange mountiong;
– Right angle, horizontal or vertical high and low dpeed shafts, also with double extension;
– Taper roller bearings;
– **Standard, oversized, hollow** olw speed shaft design (see table) for compact and economic multiple drives **in series** and **in parallel** (see page 9);

Size	Type $i \leq 2$ standard	$i \leq 2$ low speed shaft oversized	$i \leq 2$ hollow	$i \geq 2.5$ standard
				
	–			
80	1	3	4	1
100	1	3	4	1
125	1	3	4	1
160	1	3	4	1
200	1	3	4	1
250	–	3	4	2
320	–	3	4	2

– Steel shaft end: standard and oversized high and low speed shaft with keyway and tapped butt–end hole; hollow shaft with keyway and circlip groove for extraction (sizes 125 ... 320);
–《**life**》lubrication with synthetic, plugless (sizes 80 ... 125); oil bath (or forced) lubrication with filler plug with valve, (sizes 160 ... 320);
– Natural or forced cooling (see ch.12);
– **Cast iron** casing 200 UNI ISO 185;
– Paint: colour blue RAL 5010 DIN 1843;

Train of gears:

– 1 bevel gear pair made up by 1 gear and 1 or 2 pinions (or pinion) gears with i= 1);
– Casehardened and hardened gear pairs in 16 CrNi4 or 20 MnCr5 steel (depending on size) and 18 NiCr Mo5 steel, according to UNI 7846–78;
– GLEASON spiral bevel gear pairs with accurately lapped or **ground** profile;

3 – Designation

Right angle shaft gear reducers are designated according to the fol–lowing chart:

R	直角轴减速机	gear reducer (right angle shaft)
C	1 级伞齿轮减速	1 bevel gear pair
80 ... 320	伞齿轮直径 [mm]	bevel gear diameter [mm]
P	地脚固定方式	foot
F	法兰固定方式	flange
O	直角轴	orthogonal
1	标准输出轴 (规格 80 ... 200)	
2	标准输出轴 (规格 250, 320, $i \geq 2,5$)	
3	加粗低速轴 ($i \leq 2$)	
4	空心低速轴 ($i \leq 2$)	
A	标准形式	standard
...	其它(请见第8节)	others(see ch.8)

3 – 型号标记说明

订货时提供的完整的型号标记必须同时提供**输入转速n_1**，对于规格**160...320**的减速机，必须同时标明**安装方式**(如果不是**B3**或**V1**)。

例如：R C 160 PO1A/3.15 **n_1=1 120 min^{-1}, 安装方式 B8.**

如果您所需要的减速机的结构形式与以上描述均不同，请详细描述其细节；

3 – Designation

The designation must be completed station **inpu speed** n_1 and, for sizes **160 ... 320**, mounting position, although only if **different** from **B3** or **V1**.

E.g.: R C 160 PO1A/3,15 n_1=**1 120 min^{-1}, mountiong posltion B8.**

In the event of a right angle shaft gear reducer being required in a de–sign different from that statedabove , specify it in detail;

4 – 热功率 *P*t [kW]

额定热功率 $P\,t_N$ 在表中用红字表示出来，它是指在连续运转 $n_1 \leqslant 1400 min^{-1}$(更高速度请垂询我们)，最高环境温度40℃，最高海拔1000米和风速不小于1.25m/s的情况下，油温不超过95℃的时候，所允许输入减速机的最大功率。

4 – Thermal power *P*t [kW]

Nominal thermal power Pt_N, indicated in red in table below is that which can be applied at the right angle shaft gear reducer input when operating on continous duty, maximum ambient temperature of 40℃, max altitude 1 000 m and air speed≥ 1,25 m/s, without exceeding aprox. 95℃ lubricant temperature.

齿轮数 no.of gears	减速机规格 – Right angle shaft gear reducer size Pt_N kW						
	80	**100**	**125**	**160**	**200**	**250**	**320**
UI.C 833	6.3	9.5	14	22.4	33.5	50	80
	4.5	6.7	10	16	23.6	35.5	56

根据以下公式：$P\,t = P\,t_N \cdot ft$ 可知，**实际热功率Pt可以比上面给出的名义热功率值P t_N高**，此处，ft为由其他因素决定的参数，如冷却系统的使用、输入速度、环境温度及载荷特性等。

Thermal power *P*t can be higher than the nominal *P*t_N, described above, as per the following formula: $Pt = Pt_N \cdot ft$, where *ft* is the ther–mal factor depending on cooling system, input speed, ambient tem–perature and type of duty as indicated in the tables.

由**环境温度**和**输入速度**决定的热功率系数
(其值与下表中的值相乘使用)

Thermal factor as dependent on **cooling system** and **input speed** (this value is to be multiplied by that given in the table below).

冷却系统 Cooling system		输入速度 n_1[min^{-1}] ≥ 710	900	1 120	1 400
自然冷却 Natural		1			
风扇冷却 Fan cooling[1]	**带1个风扇 with 1 fan** [2]	1.18	1.25	1.32	1.5
	带1个风扇且结构型式为 ... E, ... T, ... H, ... V, ... L, ... Z with 1 fan dosigns ... E, ... T, ... H, ... V, ... L, ... Z [2]	1.25	1.4	1.6	1.8
	带2个风扇 with 2 fans [2]	1.4	1.6	1.8	2.24[3]
盘管冷却 Water cooling by coil		2			

1) 同时使用盘管冷却时，该系数再乘1.8;
2) 有关位置、尺寸和结构，请见第12节
3) 对电风扇同样适用(由使用者自行安装)。

1) With simultaneous water cooling by coil, values are multiplied by 1,8;
2) See ch.12 for positions , dimensions and design verification;
3) Value also valid for electric fan (installed by the Buyer).

由**环境温度**和**载荷类型**决定的热功率系数

Thermal factor as dependent on **ambient temperature** and type of **duty**.

最高环境温度 ℃	s1工作制	工作制 间歇负载S3...S6 工作持续系数[%] 每工作60分钟[1] 60	40	25	15
40	1	1.18	1.32	1.5	1.7
30	1.18	1.4	1.6	1.8	2
20	1.32	1.6	1.8	2	2.24
10	1.5	1.8	2	2.24	2.5

1) $\frac{\text{实际工作持续时间 [min]}}{60} \cdot 100$

Maximum ambient temperature ℃	continuous s1	Duty on intermittent load S3 ... S6 Cyclic duration factor for 60 min running[1] 60	40	25	15
40	1	1.18	1.32	1.5	1.7
30	1.18	1.4	1.6	1.8	2
20	1.32	1.6	1.8	2	2.24
10	1.5	1.8	2	2.24	2.5

1) $\frac{\text{Duration of running on load [min]}}{60} \cdot 100$

通常情况下，规格160...320减速机，当输出速度 $n_2 \geqslant 180$rpm时，应该校核输入功率P_1(是指通过该台减速机的大伞齿轮的功率，而不是通过其低速轴–通常大于前者–的功率 ），并保证其不大于热功率 *P*t，($P_1 \leqslant Pt = Pt_N \cdot ft$)。如果必要，请使用冷却系统。

当最大的连续工作时间为1–2小时(取决于规格的大小)，然后休息足够长的时间使减速机温度降到环境温度(同样需要1–2小时)则不需要考虑热功率的不足问题。

如果环境温度高40℃或低于0℃，请垂询我们。

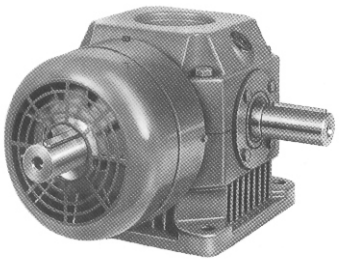
Normally for sizes 160 ... 320 and with $n_2 \geqslant 180 min^{-1}$ it should be veri–fied that the applied power P_1 (the one that 《goes through》 gear pair, not the one – eventually greater – that 《goes through》 low speed shaft) is less than or equal to *P*t value ($P_1 \leqslant Pt = Pt_N \cdot ft$), making provi–sion for forced cooling and/or special lubricants, if necessary.

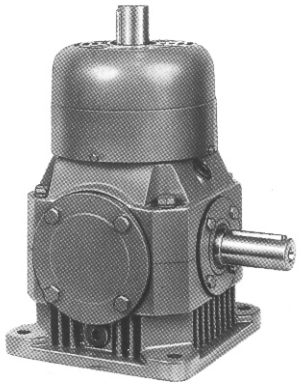
Thermal power needs not be taken into account when maximum dur–ation of continuous running time is 1 ÷ 2 h (from small to large right angle shaft gear reducer sizes) followed by rest periods long enough to restore the right angle shaft gear reducer to near ambient tempera–ture (likewise 1 ÷ 2 h).

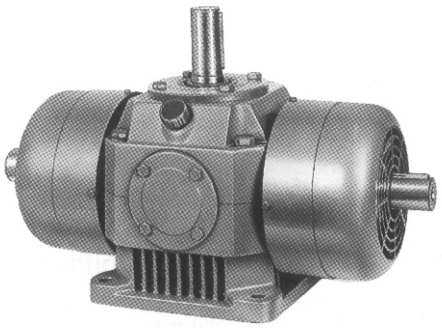
In case of maximum ambient temperature above 40℃ or below 0℃ consult us.

4 – 热功率 *Pt* [kW]

4 – Thermal power *Pt* [kW]







双伸低速轴结构，轴上带有冷却风扇，**客户需自行保证并负责使用者的人身安全**。

With double extension high speed shaft design, both shaft ends are **accessible** even with fan fitted: **personal safeguards are the Buyer's responsibility (89/392/EEC).**

5 – 服务系数 *fs*

5 – Service factor *fs*

	从动机载荷特性 Nature of load of the driven machine	运行时间(小时) Running time [h]				
		6 300 2 h/d	**12 500** 4 h/d	**25 000** 8 h/d	**50 000** 16 h/d	**80 000** 24 h/d
a	**均匀负载** **Uniform**	0.8	0.9	1	1.18	1.32
b	**中等冲击负载** (均均匀负载的1.6倍) **Moderate overloads** (1,6 × normal)	1	1.12	1.25	1.5	1.7
c	**重冲击负载** (均匀负载的2.5倍) **Heavy overloads** 2,5 × normal	1.32	1.5	1.7	2	2.24

载荷特性 Load ref.	启动频率 z [次数/小时] Frequency of starting z[starts/h]							
	2	**4**	**8**	**16**	**32**	**63**	**125**	**250**
A	1	1.06	1.12	1.18	1.25	1.32	1.4	1.5
b	1	1	1.06	1.12	1.18	1.25	1.32	1.4
c	1	1	1	1.06	1.12	1.18	1.25	1.32

输出速度n_2 转/分钟 n_2 min^{-1}	
1400 –710	1.12
710 – 355	1.06
≤355	1

服务系数的细节和影响因素：

上表中给出的服务系数适用于以下情况：

– 电机为鼠笼式电机，直接接线启动不超过9.2kW,对于功率较高的电机应使用星–角接启动。对于9.2kW以上的电机需要直接接线启动时，或使用刹车电机时，应该在选择服务系数时，以两倍于实际启动频率的z值进行选择；内燃机驱动时，fs 应乘以1.25(多缸)或1.5(单缸)；

– 最大过载时间不超过15秒；启动时间3秒；

– 相对于输出轴的过载转数不超过4转，否则，应按连续负载考虑；

– **标准的可靠性**等级：如果需要**较高**的工作可靠性(尤其是当维修困难、减速机的作用关键，或考虑到人身安全因素等时)，应在选择时将服务系数乘 以**1.25–1.4**。

– 电机的启动力矩不超过额定值（星–角启动，直流电机，单相电机），在电机，减速机和负载之间使用特定的联接方式（柔性联轴器，液力耦合器，安全耦合器，离合器，带传动等）；

Details of service factor , and considerations:

Given *fs* values are valid for:

– Electric motor with cage rotor , direct on–line starting up to 9.2kW, star–delta starting for higher power ratings; for direct on–line starting above 9.2 kW or for brake motors , select fs according to a frequency of starting double the actual frequency;for internal combustion engines multiply *fs* by 1.25(multicylinder),1.5 (single cylinder);

– Maximum time on overload 15s; on starting 3s; if over and /or subject to heavy shock effect, consult us;

– A whole number of overload cycles (or start) **imprecisely** completed in 1,2,3or 4 revolutions of low speed shaft; if **precisely** a continuous over load should be assumed

– **Standard level** of reliability; if a **highe**r degree of reliability is required (particularly difficult maintenance conditions, key importance of gear reducer to production, personal safety,etc.) Multiply fs by **1.25–1.4**

– Motors having a starting torque not exceeding nominal values (star–delta starting , particular types of motor operating on direct current,and single phase motors),and particular types of coupling between right angle shaft gear reducer and motor and driven machine(flexible , centrifugal , fluid and safety couplings, clutches and belt drives) .

6 – 产品选择

减速机规格选择

– 首先确定好所有的必需数据：减速机所需输出功率P_2，速度n_2和n_1，工作状况(载荷特性，每天运行时间，启动频率z及其他因素),参考第5节。

– 根据工作状况选定服务系数*fs* (见第5节)

– 根据n_2、n_1和大于等于$P_2 \cdot fs$的功率值P_{N2}，选定减速机规格(同时确定传动系类型及传动比)(第7节)

6 – Selection

Determining the right angle shaft gear reducer size

– Make aveilable all necessary data: required output power P_2 of right angle shaft gear reducer, speeds n_2 and n_1, running conditions (nature of load, running time, frequency of startiong z, other considerations) with reference to ch.5.

– Determine service factor fs on the basis of running conditions

– Select the right angle shaft gear reducer size (also, the transmission ratio *i* at the same time) on the basis of n_2,n_1 and of a power P_{N2} greater than of equal to $P_2 \cdot fs$ (ch.7).

6 – 产品选择

减速机规格选择

– 使用公式 $\frac{P_2}{\eta}$ 计算减速机需要的输入功率P_1，减速机效率 η=0.98–0.97

– 使用复合驱动时，请务必察看相关章节；

考虑到减速机的效率及电机标准问题，电机的装机功率$P_{1装机}$要比实际轴功率$P_{1所需}$大，一定要确定多出的功率永远都不会被用到，而且启动频率 z 不能高到影响服务系数。

否则，应在选择时在P_{N2}上乘 $\frac{P_{N2\,装机}}{P_{1\,所需}}$。

校核

– 根据第9节中的说明和数据，校核可能的径向载荷F_{r1}、F_{r2}和轴向载荷F_{a1}、F_{a2}。

– 在以下情况下需要校核减速机承受的峰值扭矩（第10节）总是小于$2M_{N2}$：如果有载荷分布图，或由于满载启动而产生过载（尤其当惯性太 大而减速比太小时）、制动、冲击、或由于其他动态和静态的原因 使得减速机的低速轴变成了驱动部件（由于从动机的惯性太大）时 如果超过， 或者无法准确量度，则需要安装安全装置以 保证$2M_{N2}$ 不会被超过。

– 当服务系数 *fs* <1, 时,要校核输出扭矩$M_2 \leqslant M_{2D}$（见《复合驱动》）

– 校核热功率：当规格为160...320，且输出速度 $n_2 \geqslant 180\ min^{-1}$时，需校核 是否需要用到强制冷却；

– 当进行复合驱动时，需根据相关章节的要求进行校核；

选型时需要注意的事项

电机功率

充分考虑减速机的效率，以及是否同时存在其它的驱动等因素，电机的功率**应该尽可能的接近从动机的所需驱动功率**，为此，建议进行比较准确的计算后确定所需驱动功率。

只有当环境温度、海拔、启动频率非常高或存在其它特定的情况的影响的时候，才可以考虑增加电机的功率。

输入速度

不同规格减速机的最高容许输入速度见右上表，(没有出现在表格中的规格减速机的最高容许输 入速度为2800rpm)。如果是间歇载荷，或者在 某些特定情况下，有可能允许更高的输入速度，但是必须事先咨询我们。

在输入速度高于1400rpm 的情况下，**功率**和**扭矩**存在一定的比例关系，见右下表；输入轴端不可存在任何径向或轴向载荷。

当输入速度存在变化时的选型，需要根据最高的输入速度值进行，同时根据最低的输入速度值进行校核。

当减速机和电机通过带轮相连接时，如果不是非常必要，建议输入速度不要超过1400rpm,最好是利用带轮的传动比，使减速机的输入速度低于900rpm。

规格. Size	传动比 Transmission ratio *i*			
	1 min^{-1}	**2** min^{-1}	**2.5, 3.15** min^{-1}	**4 ... 6.25** min^{-1}
125	2 240	2 800	2 800	2 800
160	1 800	2 800	2 800	2 800
200	1 400	2 240	2800	2 800
250	1 120	1 800	2 240	2 800
320	900	1 400	1 800	2 240

n_1 min^{-1}	P_{N2}	M_{N2}
2 800	1.4	0.71
2 240	1.25	0.8
1 800	1.12	0.9
1 400	1	1

订货时需提供的完整型号

订购时，需要按照第3节中所示要求，提供完整的产品型号，以下信息需给出：

–产品结构型式（**尽量按照手册给出的高速轴的旋向**）；
–安装方式（当规格为160...320时）；
–输入速度（见第6节）；
–非标附件等（见12节）；

例如： R C 160 PO1A/3,15 n1 =1 1 20 min–1, **安装方式** B8
R C 200 FO4F/1 风扇冷却，
n_1 =900min$_{-1}$
R C100 PC3D/2 n_1=450min^{-1}

6 – Selection

Determining the right angle shaft gear reducer size

– Calculate power P_1 requireded at input side of right angle shaft gear reducer using the formula $\frac{P_2}{\eta}$ where η 0,98÷0,97 is the efficiency of the right angle shaft gear reducer

– For multiple drives bear in mind characteristics and possibilities contained in the relevant heading.

When for reasons of motor standardizaton, power P_1 applied at input side of right angle shaft gear reducer turns out to be higher than the power required (considering motor/right angle shaft gear reducer efficiency), it must be certain that this excess power applied will never be required, and frequency of starting z is so low as not to affect service factor (ch.5).

Otherwise, make the selection by multiplying P_{N2} by $\frac{P_{N2}\,applied}{P_1\,required}$,

Verifications

– Verify possible radial loads F_{r1} and F_{r2} referring to instructions and values given in ch. 9.

– When a load chart is available, and/or there are overloads–due to starting on full olad (mainly for high inertias and low transmission ratios), braking, shocks, or right angle shaft gear reducers in which the low speed shaft becomes driving member due to driven machine inertia,or other static or dynamic causes – verify that the maximum torque peak (ch. 10) is always less than 2 • T_{N2}; if it is higher or it cannot be evaluated in the above cases, install suitable safety devices so that 2 • T_{N2} will never be exceeded.

– Verify, when *fs* <1, that $M_2 \leqslant M_{2D}$(table,《Multiple drives》).

– Verify possible need for forced cooling, usually for sizes **160···320** and whenever $n_2 \geqslant 180\ min^{-1}$;

– In the case of multiple drives,perform the checks outlined in the relevant heading.

Considerations on selection

Motor power

Taking into account the efficiency of the right angle shaft gear reducer, and other drives – if any – motor power is **to be as near as possible to the power rating required by the driven machine**: accurate calculation is therefore recommended.

Only high values of ambient temperature, altitude, frequency of staring or other particular conditions require an increase in motor power.

Input speed

Maximum input speed is, according to transmission ratio, the one stated in the first lable (for not stated sizes it must be always $n_1 \leqslant 2800min^{-1}$);for intermittent duty or particuler applications higher speeds are possible; consult us.

For $n_1 > 1400min^{-1}$, **power** and **torque** ratings relating to a given transmission ratio vary as shown in the second table.In this case no loads should be imposed on the high speed shaft end.

For variable n_1, the selection should be carried out on the basis of n_{1max}; but it should also be verified on the basis of n_{1min}.

When there is a belt drive between motor and right angle shaft gear reducer,input speed should not be higher than $1400min^{-1}$, unless conditions make it necessary; better to take advantage of the transmission, and use an input speed lower than 900 min^{-1}

Designation for ordering

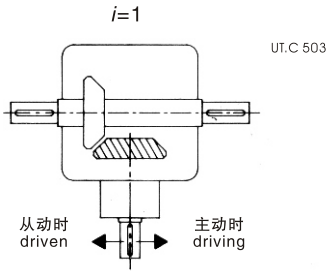
When ordering give the complete design of the right angle shaftgear reducer as shown in ch. 3. The following information are to be given:
Design (keeping in consideration the advices on **high speed shaft direction of rotation**), and mounting position(only for sizes l60 ... 320 ; inputspeed n_1(see ch.6);
non–standard designs if any （(ch. 12).

E.g. R C 160 PO1A/3,15 n_1=1 1 20 min^{-1}, mounting position B8
R C 200 FO4F/1 forced cooling by fan,
n_1 =900min^{-1}
R C100 PC3D/2 n_1=450min^{-1}

6 – 产品选择

高速轴建议旋转方向

我们建议(在可能的情况下)，请使用以下图示的高速轴旋转方向，因为我们的齿轮是**左手旋向**伞齿轮；



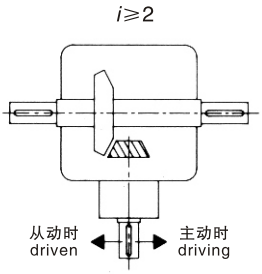
复合驱动

为了获得最大程度的结构紧凑性和经济性，同时取决于转向减速机的结构特点，并参考下表中数据以及以下条件：

– 低速轴可传递的扭矩M_{2D}仅取决于负载的载荷特性(a,b,c见第5节)，并根据 并根据低速轴类型变化而有所变化：标准实心轴，超大实心轴，空心轴等。
– 齿轮副可传递的扭矩(低速轴上齿轮)为M_{N2}(见第7节)或1.7M_{N2}(当为双高速轴形式或单高速轴但速比为1时)，需要同时校核主动轴和从动轴以保证M_{2D}和Pt满足要求。

6 – Selection

High speed shaft direction of rotation



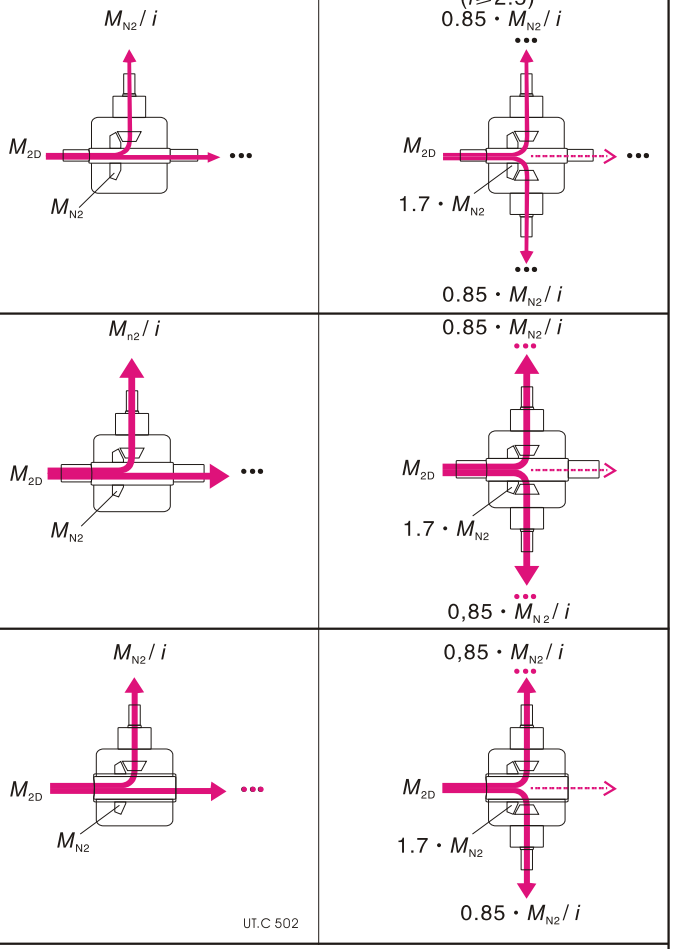
We recommend – when it is possible – the direction of rotation stated in the drawings as pinion (or gear fitted on high speed shaft when i =1) has **left hand** of spiral.

Multiple drives

In order to obtain the maximum compactness and economy of the project,depending on right angle shaft gear reducers stuctural cha–racteristics, take into account what stated in the table and resumable as follows:

– the transmissible torque from low speed shaft M_{2D}depends on the nature of load only(a,b,c,see ch 5) and changes according to the type; standard, oversized,hollow;
– the gear pair transmissible torque(referred to the low speed shaft) is M_{N2}(see ch.7)or 1,7 • M_{N2}([2 • 0,85 keeping in consideration the higher stress) in case of 2 pinions (or pinion gears with i=1) **both** driven or driving members providing that M_{2D} and Pt are verified.

载荷特性 Load ref.	减速机规格 Right angle shaft gear reducer size M_{2D} [daN m]							复合驱动图示 Multiple drive drawings	
	80	**100**	**125**	**160**	**200**	**250**	**320**	串驱动 in series	平行驱动 in parallel
	标准实心低速轴直径Φ**D**(80 ... 200; 250, 320 i ≥2.5) **Standard low speed shaft Φ D**(80 ... 200; 250, 320 i ≥2.5)								
	19	**24**	**28**	**38**	**48**	**60–55**	**75–70**		
a	8	16	31.5	71	140	280	560		
b	6.3	12.5	25	56	112	224	450		
c	4.75	9.5	19	42.5	85	170	335		
	加粗低速轴直径Φ D (i ≤2) **Oversized low speed shaft Φ D** (i ≤2)								
	24	**28**	**38**	**48**	**60**	**75**	**95**		
a	16	31.5	63	140	280	560	1120		
b	12.5	25	50	112	224	450	900		
c	9.5	19	37.5	85	170	335	670		
	空心低速轴直径Φ D_0 (i ≤2) **Hollow low speed shaft Φ D_0** (i ≤2)								
	20	**25**	**32**	**42**	**55**	**70**	**90**		
a	11.2	22.4	45	100	200	400	800		
b	9	18	35.5	80	160	315	630		
c	6.7	13.2	26.5	60	118	236	475		



校核 Verifcations

M_2 • 转角减速机数量≤ M_{2D}

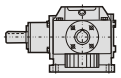
此处：M_2为传动链末端减速机低速轴端所需的扭矩

M_2 • no. of right angle shaft gear reducers≤ M_{2D}

where M_2 is the required torque at the low speed shaft and must be:

$$M_2 \leq \frac{M_{N2}}{fs} \qquad M_2 \leq \frac{1.7 \cdot M_{N2}}{fs}$$

7 – 额定功率和扭矩
7 – Nomainal powers and torques

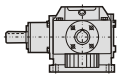


n_{N2}	n_1 [1]	i [2]	减速机规格–Right angle shaft gear reducer size													
			80		100		125		160		200		250		320	
min^{-1}			P_{N2} kW	M_{n2} daN m	P_{N2} kW	M_{n2} daN m	P_{N2} kW	M_{n2} daN m	P_{N2} kW	M_{n2} daN m	P_{N2} kW	M_{n2} daN m	P_{N2} kW	M_{n2} daN m	P_{N2} kW	M_{n2} daN m
1 400	1 400	**1**	7.8	5.3	15.5	10.6	31.1	21.2	66	45	132 ▲	90 ▲	264 ▲	180 ▲	491 ▲	335 ▲
1120	1 120	**1**	6.6	5.6	13.1	11.2	26.2	22.3	55	47.3	111	94	221 ▲	189 ▲	414 ▲	353 ▲
900	900	**1**	5.5	5.9	11.1	11.8	22.1	23.4	46.7	49.5	93	99	186	197	350 ▲	371 ▲
710	1 400	**2**	4.62	6.3	9.2	12.5	18.3	25	38.8	53	78	106	155	212	302	412
	710	**1**	4.6	6.2	9.2	12.4	18.3	24.6	38.7	52	77	103	154	207	290	391
560	1 400	**2.5**	3.93	6.7	7.7	13.2	15.5	26.5	32.8	56	66	112	131	224	264	450
	1 120	**2**	3.85	6.6	7.7	13	15.3	26	32.3	55	65	110	129	221	251	429
	560	**1**	3.82	6.5	7.6	13	15.1	25.8	31.9	54	63	108	127	216	240	410
450	1 400	**3.15**	2.93	6.3	5.8	12.5	11.6	25	24.6	53	49.3	106	99	212	198	425
	1 120	**2.5**	3.23	6.9	6.4	13.6	12.8	27.2	27	58	54	115	108	230	217	462
	900	**2**	3.22	6.8	6.4	13.6	12.7	27	27	57	54	114	108	229	210	445
	450	**1**	3.2	6.8	6.4	13.6	12.7	26.9	26.7	57	53	112	106	225	202	428
355	1 400	**4**	2.05	5.6	4.1	11.2	8.2	22.4	17.4	47.5	34.8	95	70	190	137	375
	1 120	**3.15**	2.4	6.5	4.78	12.8	9.6	25.7	20.3	55	40.5	109	81	218	162	436
	900	**2.5**	2.66	7.1	5.3	14	10.5	27.9	22.3	59	44.5	118	89	236	179	474
	710	**2**	2.64	7.1	5.3	14.2	10.5	28.1	22.1	59	44.2	119	88	238	172	463
	355	**1**	2.64	7.1	5.3	14.2	10.4	28.1	22	59	43.6	117	87	234	166	447
280	1 400	**5**	1.39	4.75	2.79	9.5	5.6	19	11.7	40	23.5	80	46.9	160	92	315
	1 120	**4**	1.69	5.8	3.38	11.5	6.8	23.1	14.4	49	28.7	98	57	196	114	387
	900	**3.15**	1.98	6.6	3.94	13.2	7.9	26.4	16.7	56	33.3	112	67	223	134	448
	710	**2.5**	2.16	7.2	4.28	14.4	8.5	28.6	18.1	61	36.1	121	72	243	145	486
	560	**2**	2.17	7.4	4.32	14.8	8.6	29.3	18.1	62	36.2	124	72	247	141	480
	280	**1**	2.18	7.4	4.35	14.8	8.6	29.3	18.1	62	35.7	122	71	244	137	467
224	1 400	**6.25**	0.83	3.55	1.67	7.1	3.28	14	7	30	14.1	60	27.7	118	55	236
	1 120	**5**	1.15	4.89	2.29	9.8	4.59	19.6	9.7	41.2	19.3	82	38.7	165	76	325
	900	**4**	1.4	6	2.79	11.8	5.6	23.7	11.9	51	23.7	101	47.4	201	94	399
	710	**3.15**	1.6	6.8	3.2	13.6	6.4	27.1	13.6	58	27	115	54	230	108	460
	560	**2.5**	1.75	7.4	3.47	14.8	6.9	29.3	14.7	63	29.2	125	58	249	117	499
	450	**2**	1.81	7.7	3.6	15.3	7.1	30.3	15	64	30.1	128	60	255	117	496
	224	**1**	1.81	7.7	3.62	15.4	7.1	30.4	15	64	29.6	126	59	253	114	485
180	1 120	**6.25**	0.69	3.66	1.37	7.3	2.72	14.5	5.8	30.9	11.6	62	22.9	122	45.7	244
	900	**5**	0.95	5	1.89	10	3.79	20.1	8	42.4	16	85	32	170	63	335
	710	**4**	1.14	6.1	2.27	12.2	4.54	24.4	9.7	52	19.2	104	38.5	207	77	412
	560	**3.15**	1.3	7	2.59	13.9	5.2	27.8	11	59	21.9	118	43.8	236	88	472
	450	**2.5**	1.44	7.6	2.86	15.2	5.7	30	12.1	64	24	127	48.1	255	96	511
	355	**2**	1.48	7.9	2.95	15.9	5.8	31.4	12.3	66	24.6	132	49.1	264	96	514
	180	**1**	1.51	8	3.02	16	5.9	31.5	12.5	66	24.6	131	49.2	261	95	503
140	900	**6.25**	0.57	3.78	1.14	7.6	2.26	15	4.8	31.8	9.6	64	19	126	37.9	251
	710	**5**	0.77	5.2	1.54	10.3	3.08	20.7	6.5	43.7	13	87	26	175	52	346
	560	**4**	0.93	6.3	1.84	12.5	3.69	25.1	7.9	54	15.6	107	31.2	213	62	425
	450	**3.15**	1.07	7.1	2.13	14.3	4.26	28.5	9.1	61	18	120	36.1	241	72	483
	355	**2.5**	1.16	7.8	2.32	15.6	4.57	30.8	9.8	66	19.4	131	38.9	261	78	524
	280	**2**	1.21	8.2	2.41	16.5	4.76	32.5	10	68	20	137	40.1	274	78	532
	140	**1**	1.17	8	2.35	16	4.62	31.5	10.1	69	19.9	136	39.8	271	77	524
112	710	**6.25**	0.463	3.9	0.93	7.8	1.84	15.5	3.9	32.8	7.8	66	15.4	130	30.9	260
	560	**5**	0.62	5.3	1.25	10.6	2.49	21.3	5.3	45	10.6	90	21.1	180	41.9	358
	450	**4**	0.77	6.5	1.51	12.9	3.04	25.8	6.5	55	12.9	109	25.7	218	51	437
	355	**3.15**	0.86	7.3	1.72	14.6	3.45	29.3	7.4	62	14.5	123	29.2	247	58	495
	280	**2.5**	0.94	8	1.88	16	3.69	31.5	7.9	68	15.7	134	31.4	268	63	536
	224	**2**	1	8.5	1.99	17	3.93	33.5	8.3	71	16.5	141	33.1	282	64	548
	112	**1**	0.94	8	1.88	16	3.69	31.5	8.3	71	16.4	140	32.8	280	64	542
90	560	**6.25**	0.377	4.02	0.75	8	1.5	16	3.17	33.7	6.3	68	12.6	134	25.1	268
	450	**5**	0.51	5.5	1.03	10.9	2.06	21.8	4.35	46.2	8.7	92	17.4	185	34.6	368
	355	**4**	0.62	6.7	1.23	13.2	2.46	26.5	5.3	57	10.4	112	20.9	224	41.8	450
	280	**3.15**	0.7	7.5	1.39	15	2.79	30	5.9	64	11.8	126	23.6	254	47.2	507
	224	**2.5**	0.75	8	1.5	16	2.96	31.5	6.5	69	12.9	137	25.7	274	51	548
	180	**2**	0.8	8.5	1.6	17	3.16	33.5	6.8	73	13.7	145	27.4	290	53	565
	90	**1**	0.75	8	1.51	16	2.97	31.5	6.7	71	13.2	140	26.4	280	53	560

▲ 有可能需要使用强制润滑系统或散热装置，请垂询我们
1) n_1 > 1400rpm时，见第6节；n_1 <90 rpm时，M_{N2}保持不变(与n_1=90 rpm时相比)

▲ Possible forced lubrication with heat exchanger: consult us:
1) For n_1 > 1 400 min^{-1} see ch.6; for n_1 < **90min**$^{-1}$ M_{n2} keeps unchanged (compared to the one at n_1=90min^{-1}).

7 – 额定功率和扭矩
7 – Nomainal powers and torques



n_{N2}	n_1 [1]	i [2]	减速机规格–Right angle shaft gear reducer size													
			80		100		125		160		200		250		320	
min^{-1}			P_{N2} kW	M_{n2} daN m	P_{N2} kW	M_{n2} daN m	P_{N2} kW	M_{n2} daN m	P_{N2} kW	M_{n2} daN m	P_{N2} kW	M_{n2} daN m	P_{N2} kW	M_{n2} daN m	P_{N2} kW	M_{n2} daN m
71	450	**6.25**	0.311	4.13	0.62	8.3	1.24	16.5	2.61	34.6	5.2	69	10.4	138	20.8	276
	355	**5**	0.416	5.6	0.83	11.2	1.67	22.4	3.53	47.5	7.1	95	14.1	190	28.2	379
	280	**4**	0.491	6.7	0.97	13.2	1.94	26.5	4.29	58	8.4	115	16.9	230	33.9	463
	224	**3.15**	0.56	7.5	1.12	15	2.23	30	4.87	66	9.6	129	19.3	259	38.6	519
	180	**2.5**	0.6	8	1.21	16	2.37	31.5	5.4	71	10.6	140	21.1	280	42.2	560
	140	**2**	0.62	8.5	1.25	17	2.46	33.5	5.5	75	11	150	22	300	42.8	583
56	355	**6.25**	0.253	4.25	0.51	8.5	1.01	17	2.12	35.6	4.24	71	8.4	142	16.9	284
	280	**5**	0.328	5.6	0.66	11.2	1.31	22.4	2.86	48.8	5.7	98	11.4	195	22.8	390
	224	**4**	0.393	6.7	0.77	13.2	1.55	26.5	3.52	60	6.9	118	13.8	236	27.9	475
	180	**3.15**	0.448	7.5	0.9	15	1.79	30	4	67	7.9	132	15.8	265	31.7	530
	140	**2.5**	0.469	8	0.94	16	1.85	31.5	4.16	71	8.2	140	16.4	280	32.8	560
	112	**2**	0.498	8.5	1	17	1.96	33.5	4.4	75	8.8	150	17.6	300	35.2	600
45	280	**6.25**	0.199	4.25	0.399	8.5	0.8	17	1.72	36.6	3.43	73	6.9	146	13.7	292
	224	**5**	0.263	5.6	0.53	11.2	1.05	22.4	2.35	50	4.69	100	9.4	200	18.8	400
	180	**4**	0.316	6.7	0.62	13.2	1.25	26.5	2.83	60	5.6	118	11.1	236	22.4	475
	140	**3.15**	0.349	7.5	0.7	15	1.39	30	3.11	67	6.1	132	12.3	265	24.6	530
	112	**2.5**	0.375	8	0.75	16	1.48	31.5	3.33	71	6.6	140	13.1	280	26.3	560
	90	**2**	0.401	8.5	0.8	17	1.58	33.5	3.53	75	7.1	150	14.1	300	28.3	600
36	224	**6.25**	0.159	4.25	0.319	8.5	0.64	17	1.41	37.5	2.81	75	5.6	150	11.3	300
	180	**5**	0.211	5.6	0.422	11.2	0.84	22.4	1.88	50	3.77	100	7.5	200	15.1	400
	140	**4**	0.246	6.7	0.484	13.2	0.97	26.5	2.2	60	4.32	118	8.6	236	17.4	475
	112	**3.15**	0.279	7.5	0.56	15	1.12	30	2.49	67	4.91	132	9.9	265	19.7	530
	90	**2.5**	0.302	8	0.6	16	1.19	31.5	2.68	71	5.3	140	10.6	280	21.1	560
28	180	**6.25**	0.128	4.25	0.256	8.5	0.51	17	1.13	37.5	2.26	75	4.52	150	9	300
	140	**5**	0.164	5.6	0.328	11.2	0.66	22.4	1.47	50	2.93	100	5.9	200	11.7	400
	112	**4**	0.196	6.7	0.387	13.2	0.78	26.5	1.76	60	3.46	118	6.9	236	13.9	475
	90	**3.15**	0.224	7.5	0.448	15	0.9	30	2	67	3.94	132	7.9	265	15.8	530
22	140	**6.25**	0.1	4.25	0.199	8.5	0.399	17	0.88	37.5	1.76	75	3.52	150	7	300
	112	**5**	0.131	5.6	0.263	11.2	0.53	22.4	1.17	50	2.35	100	4.69	200	9.4	400
	90	**4**	0.158	6.7	0.311	13.2	0.62	26.5	1.41	60	2.78	118	5.6	236	11.2	475
18	112	**6.25**	0.08	4.25	0.159	8.5	0.319	17	0.7	37.5	1.41	75	2.81	150	5.6	300
	90	**5**	0.106	5.6	0.211	11.2	0.422	22.4	0.94	50	1.88	100	3.77	200	7.5	400
14	90	**6.25**	0.064	4.25	0.128	8.5	0.256	17	0.57	37.5	1.13	75	2.26	150	4.52	300

▲ 有可能需要使用强制润滑系统或散热装置，请垂询我们

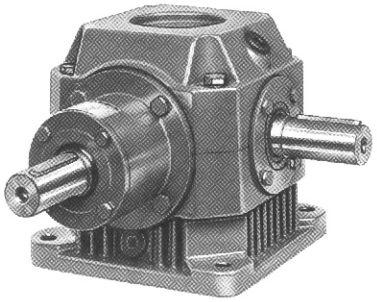
1) n_1 > 1400rpm时，见第6节；n_1 <90 rpm时，M_{N2}保持不变(与n_1=90 rpm时相比)

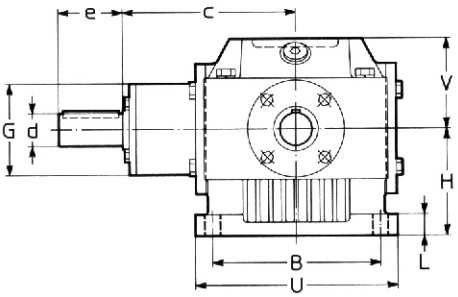
▲ Possible forced lubrication with heat exchanger: consult us:

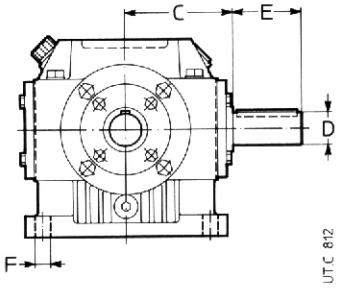
1) For n_1 > 1 400 min^{-1} see ch.6; for n_1 < **90min**$^{-1}$ M_{n2} keeps unchanged (compared to the one at n_1=90min^{-1}).

8 – 结构、尺寸、安装方式和润滑油使用量　8 – Designs,dimensions,mounting positions and lubricant quantities

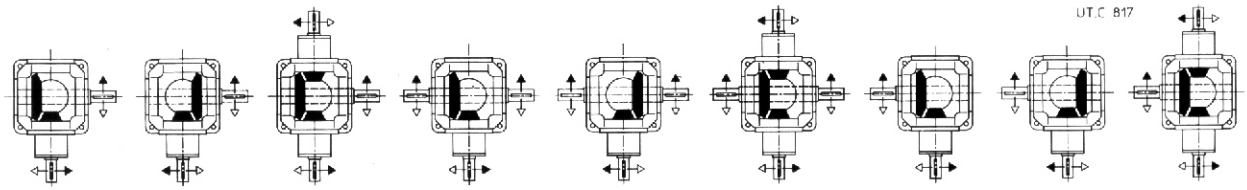
结构形式–Design：PO···A, Asin, D, F, Fsin, G, N, Nsin, M







类型 -Type　标准低速轴–standard　**PO1 ...** (80 ... 200), **PO2 ...** (250,320,$i \geq 2.5$)
加粗低速轴–oversized low speed shaft　**PO3 ...** ($i \leq 2$)



i								
1 ... 6.25	(80 ... 200)	**PO1A**	**PO1Asin**	**PO1D (i≥2.5)**	**PO1F**	**PO1Fsin**	**PO1G (i≥2,5)**	**PO1N**	**PO1Nsin**	**PO1M (i≥2,5)**
2.5....6.25	(250, 320)	**PO2A**	**PO2Asin**	**PO2D**	**PO2F**	**PO2Fsin**	**PO2G**	**PO2N**	**PO2Nsin**	**PO2M**
1, 2	(80 ... 320)	**PO3A**	**PO3Asin**	**PO3D**	**PO3F**	**PO3Fsin**	**PO3G**	**PO3N**	**PO3Nsin**	**PO3M**

规格 Size	B □	C	c		D Ø	E	D Ø	E	d Ø	e	d Ø	e	d Ø	e	F Ø	G Ø max 最大	H h11	L	U □	V 3)	重量 Mass Kg	油量 Quantity 油 oil L[2]	油脂 grease kg
			$i \leq 2$	$i \geq 2.5$	... 1 ... ...2...	$i \geq 2.5$	...3... $i \leq 2$		$i \leq 2$		$i = 2.5, 3.15$		$i \geq 4$										
80	110	71	119	108	19	40	24	36	19	40	16	30	14	30	9.5	60	71	12	132	58	8	–	0.3
100	132	85	142	131	24	50	28	42	24	50	19	40	16	30	11.5	71	85	16	160	69	14	–	0.55
125	155	100	168	157	28	60	38	58	28	60	24	50	19	40	14	88	100	20	190	85	24	–	1.1
160	196	125	202	188	38	80	48	82	38	80	28	60	24	50	16	108	125	25	236	105	43	1.8	–
200	235	150	246	226	48	110	60	105	48	110	38	80	32	80	18	126	150	28	280	129	76	3.55	–
250	285	180	305	282	60[1]	140[1]	75	105	55	110	48	110	38	80	22	156	180	36	340	160	123	7.1	–
320	360	225	≤2.5 380	≥3.15 357	75[1]	140[1]	95	130	70 ≤2.5	140	55 = 3.15	110	48	110	27	197	225	45	425	200	225	15	–

1) 带有双伸低速轴，双轴的尺寸D，E，分别为55和110(规格250)；70和140(规格320)；
2) 表中油量为可能的最大用油量，实际用油量因结构、安装方式、减速比、　输入速度不同而不同；
3) 由于标准化原因，可能与V,相同，见16页。

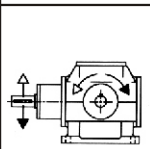
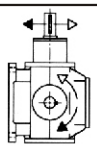
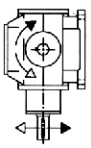
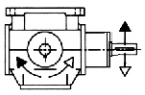
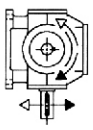
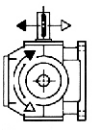
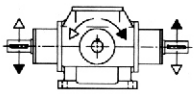
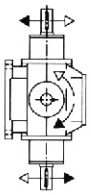
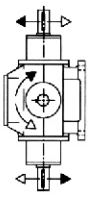
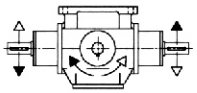
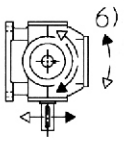
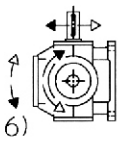
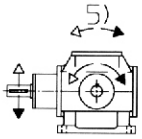
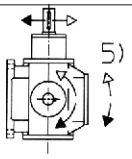
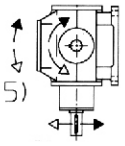
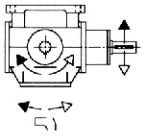
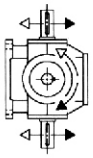
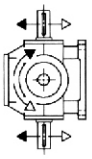
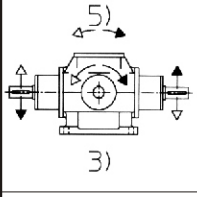
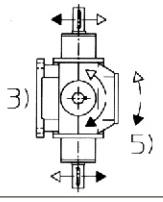
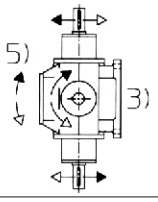
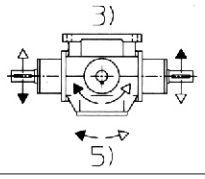
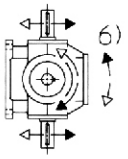
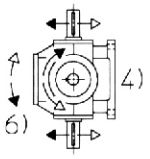
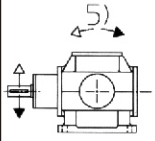
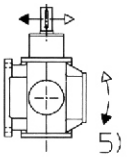
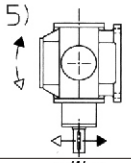
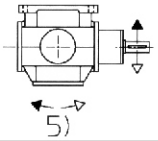
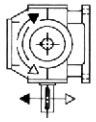
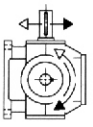
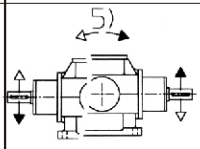
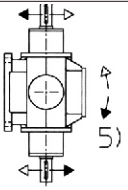
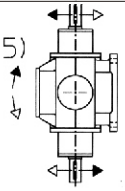
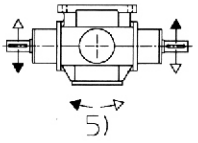
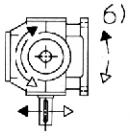
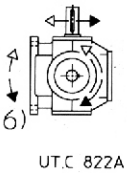
1) With double extension low speed shaft, the two shaft end dimensions D and E will be 55 and 110 respctively (size 250); 70 and 140 (size 320).
2) Oil quantities indicated represent the maximum; the actual amount will be determined by the oil level according to design, mounting position, transmission ratio and input speed.
3) For standardisation reasons can be egual to V, of page 16.

8 – 结构、尺寸、安装方式和润滑油使用量

8 – Designs,dimensions,mounting positions and lubricant quantities

安装方式[1] (轴的旋转方向)

Mounting positions[1] (direction of rotation)

结构形式 Design	B3	B6	B7	B8	V5	V6
PO ... A PO ... A sin[2]						
PO ... D						
PO ... F PO ... F sin[2]						
PO ... G						
PO ... N PO ... N sin[2]						
PO ... M						

UT.C 822A

1) 规格80…125的减速机,不必在型号标记中标出安装方式，
规格160…320减速机的安装方式,可以简单的由透气阀的位置确定(透气阀向上)；

2) ...**sin**结构的减速机，轴的旋向关系与标准型的对称；

3) 背面也有一根低速轴；
4) 上部(V5安装方式)或下部(V6安装方式)也有一根低速轴；
5) 双伸低速轴的旋向图中不可见；
6) 双伸高速轴的旋向图中不可见；

除非特别注明，否则减速箱将以**B3标准安装方式**提供，并已经在型号标记中**省略**安装方式。

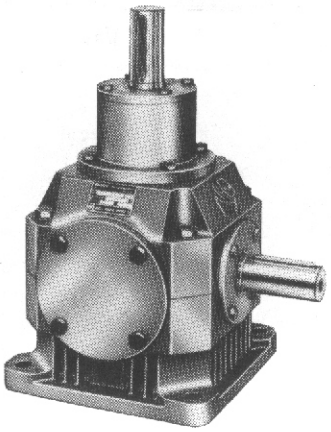
1) For right angle shaft gear reducers (sizes 80 ... 125), mounting position is **omitted** from the designation. The right identification of the mounting position (sizes 160 ... 320) is Determined by the **upper** position of filler plug.
2) For design ... **sin**, the direction of rotation of high speed shaft/s is inverted compared to the stated one.
3) Consider the low speed shaft gear**« behind »**.
4) Consider the low speed shaft gear**« above »**(V5) and**« below»** (V6).
5) Dirction of rotation of the **low speed** shaft extension not in view.
6) Direction of rotation of the second high speed shaft extension not in view.

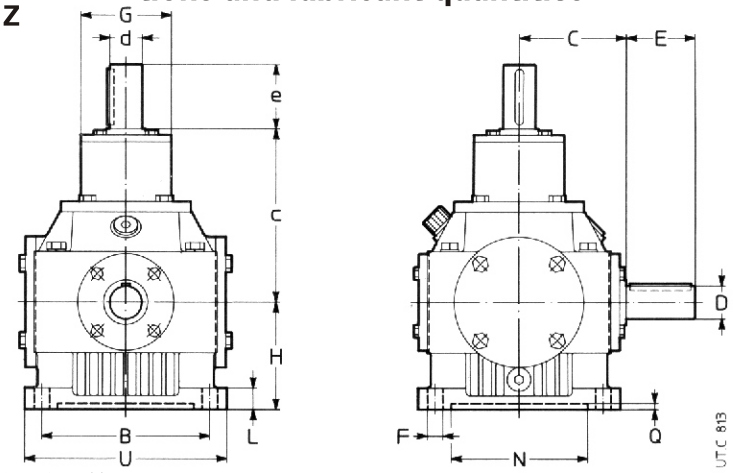
Unless otherwise stated, right angle shaft gear reducers are supplied in mountiong position **B3** which, being standard, is **omitted** from the designation.

8 – 结构、尺寸、安装方式和润滑油使用量

8 – Designs,dimensions,mounting positions and lubricant quantities

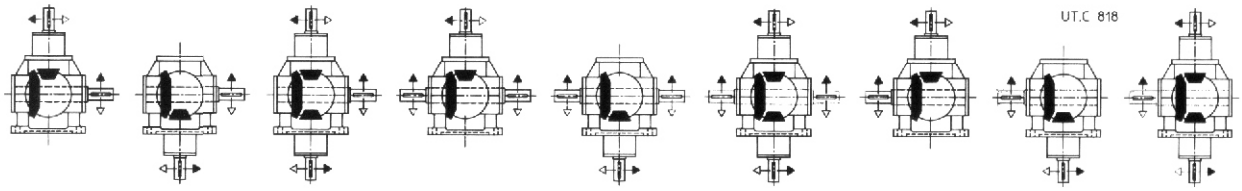
结构形式–Design：PO···E, P, T, H, R, V, L, S, Z





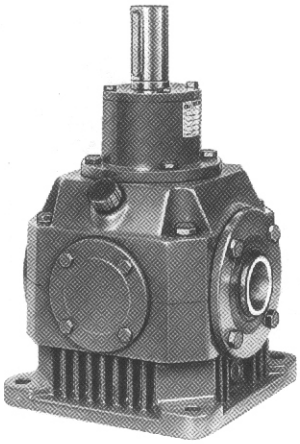
类型-Type

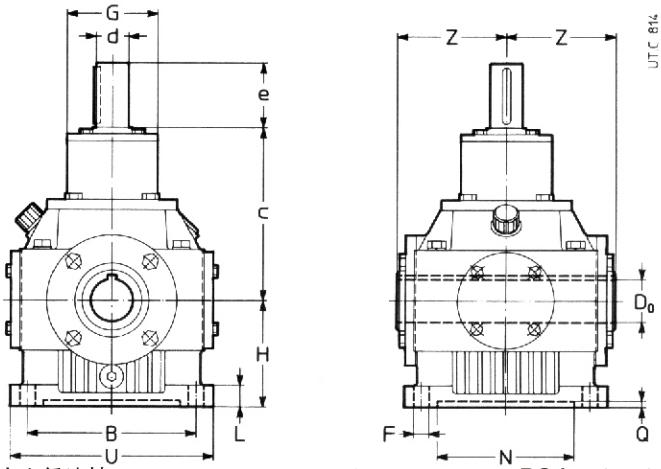
标准低速轴–standard **PO1 ...** (80 ... 200), **PO2 ...** (250,320,*i*≥2.5)
加粗低速轴–oversized low speed shaft **PO3 ...** (*i*≤2)



i									
1 ... 6.25	(80 ... 200)	**PO1E**	**PO1P**	**PO1T (i≥2.5)**	**PO1H**	**PO1R**	**PO1V(i≥2.5)**	**PO1L**	**PO1S**	**PO1Z (i≥2.5)**
2.5 ... 6.25	(250, 320)	**PO2E**	**PO2P**	**PO2T**	**PO2H**	**PO2R**	**PO2V**	**PO2L**	**PO2S**	**PO2Z**
1,2	(80 ... 320)	**PO3E**	**PO3P**	**PO3T**	**PO3H**	**PO3R**	**PO3V**	**PO3L**	**PO3S**	**PO3Z**

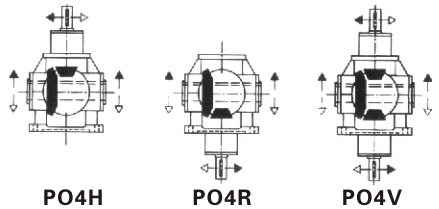
结构形式–Design:PO4 H, R, V





类型-Type

空心低速轴 – hollow low speed shaft **PO4 ...** (*i*≤2)



i	**PO4H**	**PO4R**	**PO4V**
1, 2(80 ... 320)			

规格 Size	**B** ◻	**C**	**c** *i*≤2	**c** *i*≥2.5	**D** Ø ...1... ...2... *i*≥2.5	**E**	**D** Ø ... 3 ... *i*≤2	**E**	**D0** Ø H7 ...4... *i*≤2 3)	**Z**	**d** Ø *i*≤2	**e**	**d** Ø *i*=2.5, 3.15	**e**	**d** Ø *i*≥4	**e**	**F** Ø	**G** Ø max	**H** H11	**L**	**N** Ø H7	**Q**	**U** ◻	重量 Mass Kg	油量 Quantity 油 oil L 2)	脂 grease kg
80	110	71	119	108	19	40	24	36	20	70	19	40	16	30	14	30	9.5	60	71	12	90	3.5	132	8	–	0.3
100	132	85	142	131	24	50	28	42	25	84	24	50	19	40	16	30	11.5	71	85	16	106	4	160	14	–	0.55
125	155	100	168	157	28	60	38	58	32	99	28	60	24	50	19	40	14	88	100	20	125	4	190	24	–	1.1
160	196	125	202	188	38	80	48	82	42	124	38	80	28	60	24	50	16	108	125	25	160	5	236	43	1.8	–
200	235	150	246	226	48	110	60	105	55	148	48	110	38	80	32	80	18	126	150	28	200	5	280	76	3.55	–
250	285	180	305 ≤2.5	282 ≥3.15	60 1)	140 1)	75	105	70	179	55 ≤2.5	110	48 =3.15	110	38	80	22	156	180	36	250	6	340	123	7.1	–
320	360	225	380	357	75 1)	140 1)	95	130	90	224	70	140	55	110	48	110	27	197	225	45	320	6	425	225	15	–

1) 带有双伸低速轴，双轴的尺寸D，E，分别为55和110(规格250)；70和140(规格320)；
2) 表中油量为可能的最大用油量，实际用油量因结构、安装方式、减速比、输入速度不同而不同；
3) 详细尺寸请见第10节；
4) 可以再加1或2个高速轴(见12节)

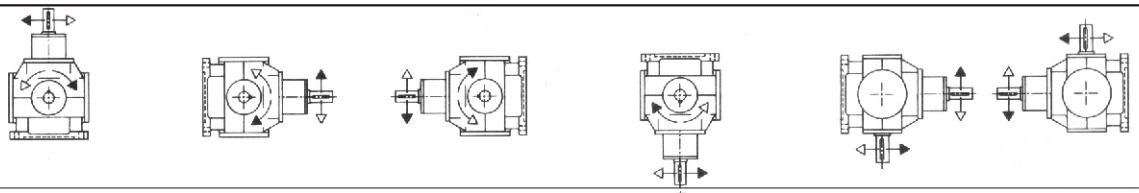
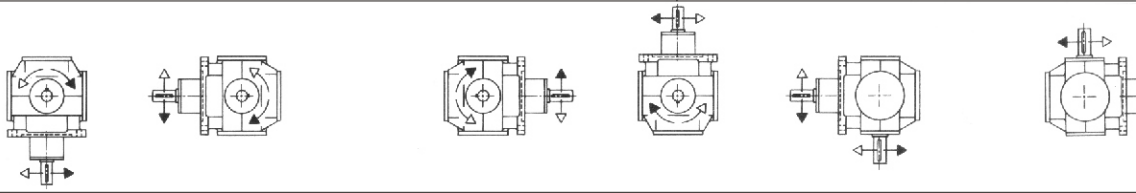
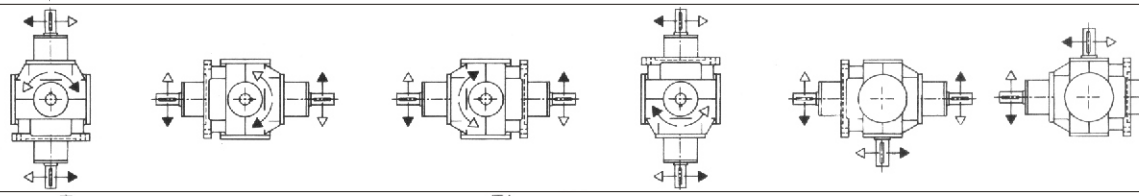
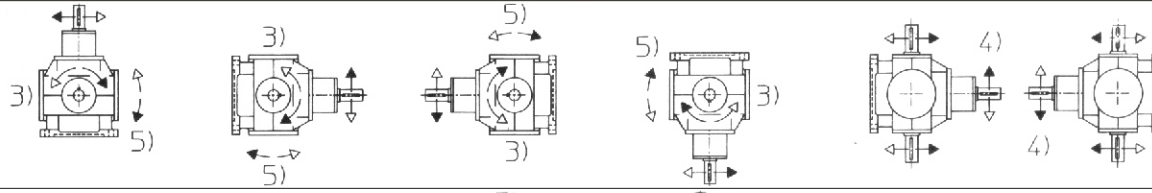
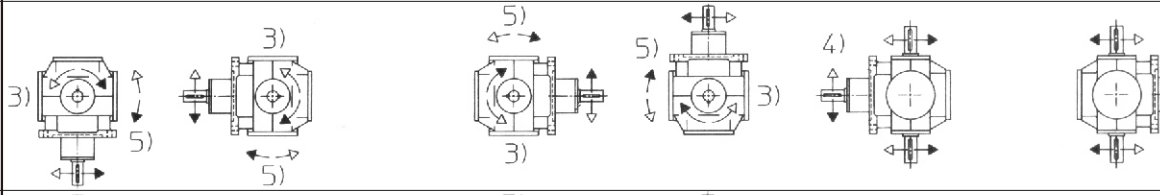
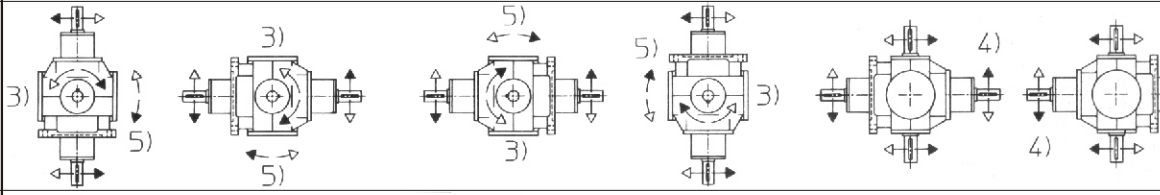
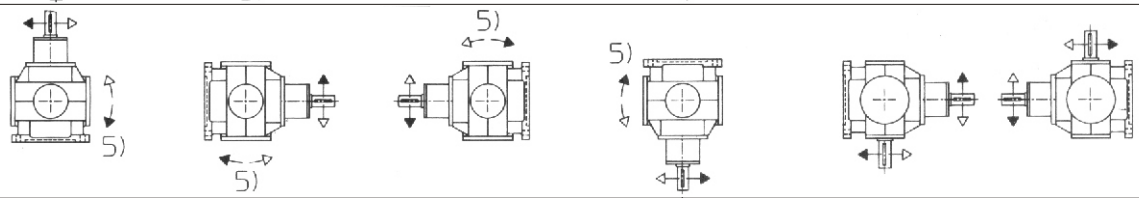
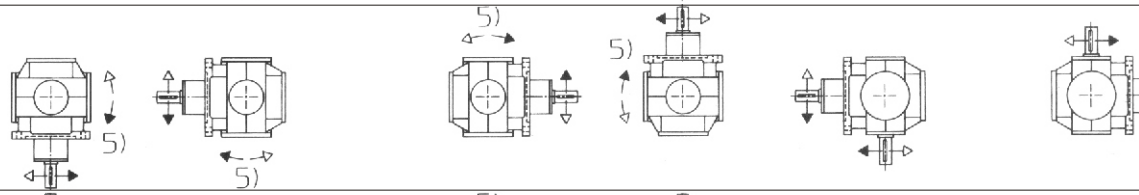
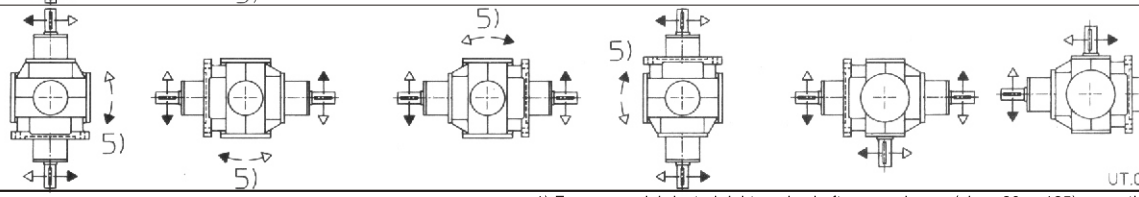
1) With double extension low speed shaft, the two shaft end dimensions D and E will be 55 and 110 respectively (size 250); 70 and 140 (size 320).
2) Oil quantities indicated represent the maximum; the actual amount will be determined by the oil level according to design, mountion position, transmission ratio and input speed.
3) For dimensional details see ch. 10.
4) Possibility to have one or two additional high speed shafts (see ch. 12).

8 – 结构、尺寸、安装方式和润滑油使用量

8 – Designs,dimensions,mounting positions and lubricant quantities

安装方式[1] (轴的旋转方向)

Mounting positions[1] (direction of rotation)

结构形式 Design	B3	B6	B7	B8	V5	V6
PO ... E						
PO ... P						
PO ... T						
PO ... H						
PO ... R						
PO ... V						
PO ... L						
PO ... S						
PO ... Z						

UT.C 823

1) 规格80...125的减速机,不必在型号标记中标出安装方式，
规格160...320减速机的安装方式,可以简单的由透气阀的位置确定(透气阀向上)；

3) 背后也有一根低速轴；
4) 上部(V5安装方式)或下部(V6安装方式)也有一根低速轴；
5) 双伸低速轴的旋向图中不可见；

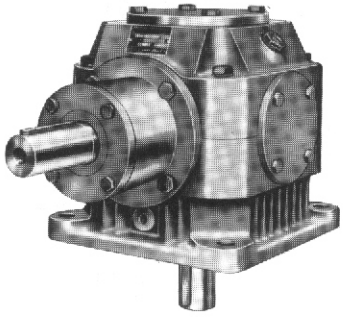
除非特别注明，否则减速箱将以**B3标准安装方式**提供，并已经在型号标记中**省略**安装方式。

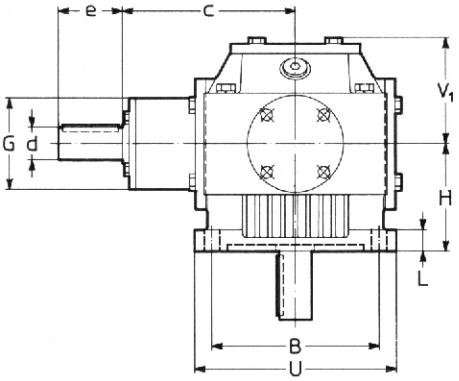
1) For grease–lubricated right angle shaft gear reducers (sizes 80 ... 125), mounting position is **omitted** from the designation. The right identification of the mounting position (sizes 160 ... 320) is determined by the **upper** position of filler plug.
3) Consider the low speed shaft gear **« behind »**
4) Consider the low speed shaft gear **« above »**(V5) and **« below »**(V6).
5) Dirction of rotation of the **low speed** ahaft extension not in view.

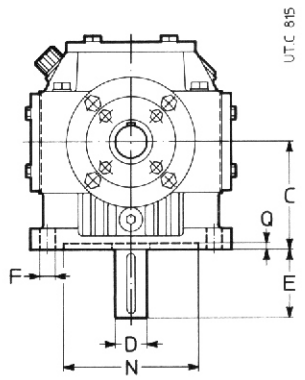
Unless otherwise stated, right angle shaft gear reducers are supplied in mountiong position **B3** which, being standard, is **omitted** from the designation.

8 – 结构、尺寸、安装方式和润滑油使用量　8 – Designs,dimensions,mounting positions and lubricant quantities

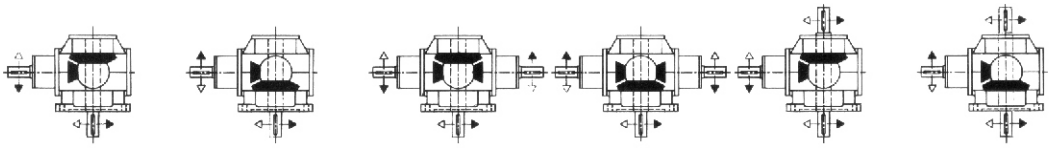
结构形式–Design：PO···A, Asin, D, Dsin, F, Fsin, G, Gsin, N, Nsin, M, Msin



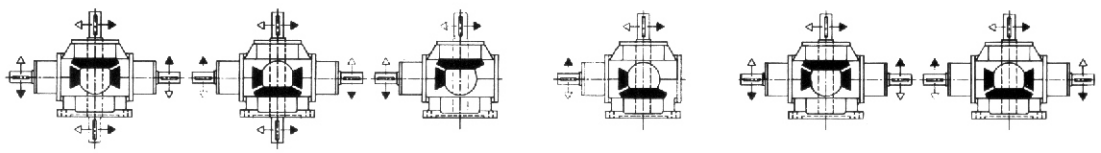




类型-Type　标准低速轴–standard　**FO1** ... (80 ... 200), **FO2** ... (250,320,$i \geq 2.5$)
加粗低速轴–oversized low speed shaft　**FO3** ... ($i \leq 2$)

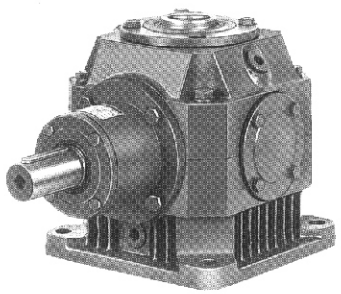


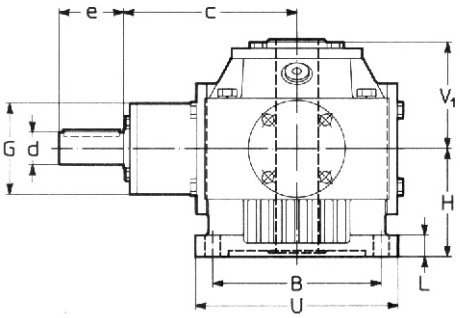
i							
1 ... 6.25	(80 ... 200)	**FO1A**	**FO1Asin**	**FO1D (i≥2.5)**	**FO1Dsin (i≥2.5)**	**FO1F**	**FO1Fsin**
2.5 ... 6.25	(250, 320)	**FO2A**	**FO2Asin**	**FO2D**	**FO2Dsin**	**FO2F**	**FO2Fsin**
1,2	(80 ... 320)	**FO3A**	**FO3Asin**	**FO3D**	**FO3Dsin**	**FO3F**	**FO3Fsin**

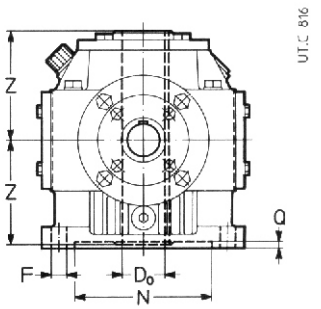


i							
1 ... 6.25	(80 ... 200)	**FO1G (i≥2,5)**	**FO1G sin(i≥2.5)**	**FO1N**	**FO1Nsin**	**FO1M (i≥2.5)**	**FO1Msin (i≥2.5)**
2.5 ... 6.25	(250, 320)	**FO2G**	**FO2Gsin**	**FO2N**	**FO2Nsin**	**FO2M**	**FO2Msin**
1,2	(80 ... 320)	**FO3G**	**FO3Gsin**	**FO3N**	**FO3Nsin**	**FO3M**	**FO3Msin**

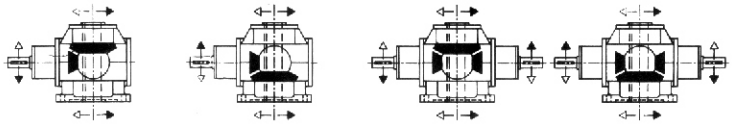
结构形式–Design：FO4 F, F sin, G, G sin







类型-Type　空心低速轴 – hollow low speed shaft　**FO4** ... ($i \leq 2$)



i
1, 2(80 ... 320)

FO4F　**FO4Fsin**　**FO4G**　**FO4Gsin**

规格 Size	B □	C	C $i \leq 2$	C $i \geq 2.5$	D Ø …1…2…	E …1…2… $i \geq 2.5$	D Ø …3…	E …3… $i \leq 2$	D Ø H7 …4…	Z …4… $i \leq 2$ [3]	d Ø	e $i \leq 2$	d Ø	e $i = 2.5, 3.15$	d Ø	e $i \geq 4$	F Ø	G Ø max	H h11	L	N H7	Q Ø	U □	V_1	重量 Mass Kg	油量 Quantity 油 Oil L[2]	脂 Grease kg
80	110	71	119	108	19	40	24	36	20	70	19	40	16	30	14	30	9.5	60	71	12	90	3,5	132	69	8	–	0.3
100	132	85	142	131	24	50	28	42	25	84	24	50	19	40	16	30	11.5	71	85	16	106	4	160	83	14	–	0.55
125	155	100	168	157	28	60	38	58	32	99	28	60	24	50	19	40	14	88	100	20	125	4	190	99	24	–	1.1
160	196	125	202	188	38	80	48	82	42	124	38	80	28	60	24	50	16	108	125	25	160	5	236	123	43	1.8	–
200	235	150	246	226	48	110	60	105	55	148	48	110	38	80	32	80	18	126	150	28	200	5	280	147	76	3.55	–
250	285	180	305 ≤2.5	282 ≥3.15	60[1]	140[1]	75	105	70	179	55 ≤2.5	110	48 =3.15	110	38	80	22	156	180	36	250	6	340	178	123	7.1	–
320	360	225	380	357	75[1]	140[1]	95	130	90	224	70	140	55	110	48	110	27	197	225	45	320	6	425	221	225	15	–

1) 带有双伸低速轴，双轴的尺寸D，E，分别为55和110(规格250)；70和140(规格320)；
2) 表中油量为可能的最大用油量，实际用油量因结构、安装方式、减速比、输入速度不同而不同；
3) 详细尺寸请见第10节。

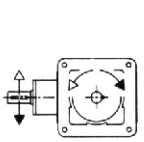
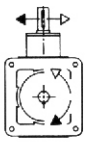
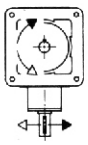
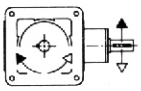
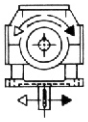
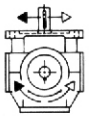
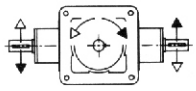
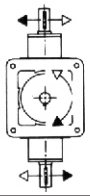
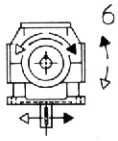
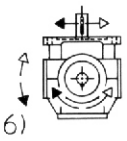
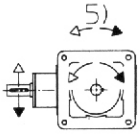
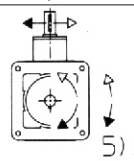
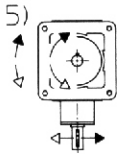
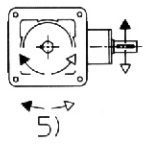
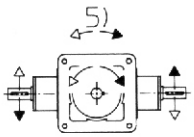
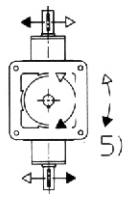
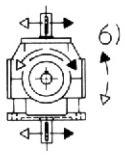
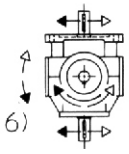
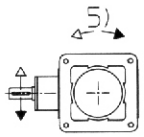
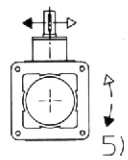
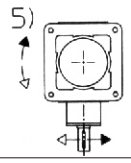
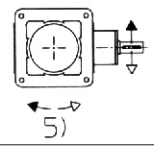
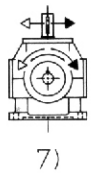
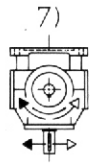
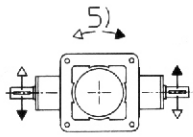
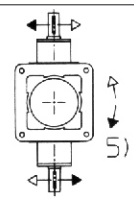
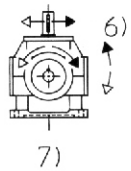
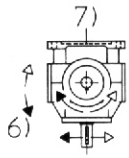
1) With double extension low speed shaft, the two shaft end dimensions D and E will be 55 and 110 respectively (size 250); 70 and 140 (size 320).
2) Oil quantities indicated represent the maximum; the actual amount will be determined by the oil level according to design, mountion position, transmission ratio and input speed.
3) For dimensional details see ch. 10.

8 – 结构、尺寸、安装方式和润滑油使用量

8 – Designs,dimensions,mounting positions and lubricant quantities

安装方式[1] (轴的旋转方向)

Mounting positions[1] (direction of rotation)

结构形式 Design	B5	B51	B52	B53	V1[7]	V3[7]
FO ... A FO ... A sin[2]						
FO ... D FO ... D sin[2]						
FO ... F FO ... F sin[2]						
FO ... G FO ... G sin[2]						
FO ... N FO ... N sin[2]						
FO ... M FO ... M sin[2]						

UT.C 824

1) 规格80…125的减速机,不必在型号标记中标出安装方式，
规格160…320减速机的安装方式,可以简单的由透气阀的位置确定(透气阀向上)；

2) ...**sin**结构的减速机，轴的旋向关系与标准型的对称；

5) 双伸低速轴的旋向图中不可见；
6) 双伸高速轴的旋向图中不可见。
7) FO…N sin，FO … M sin，当安装方式为V1，V3时，手册中相应标记为V2，V4。

除非特别注明，否则减速箱将以**B3标准安装方式**提供，并已经在型号标记中**省略**安装方式。

1) For grease–lubricated right angle shaft gear reducers (sizes 80 ... 125), mounting position is **omitted** from the designation. The right identification of the mounting position (sizes 160 ... 320) is determined by the **upper** position of filler plug.
2) For design ... **sin**, the direction of rotation of high speed shaft/s is inverted compared to the staed one.
5) Dirction of rotation of the **low speed** ahaft extension not in view.
6) Direction of rotation of the second high speed shaft extension not in view.
7) For designs FO ... N sin, FO ... M sin, mounting position V1,V3 becomes V2, V4 respectively.

Unless otherwise stated, right angle shaft gear reducers are supplied in mountiong position **B3** which, being standard, is **omitted** from the designation.

9 – 高速轴端径向载荷[1] F_{r1}[daN]和低速轴端径向载荷F_{r2}[daN]

加在减速机高速轴端的径向载荷，必须小于或等于在相关表中给出的值。

通常情况下，有驱动产生的径向载荷值F_r, 由以下公式确定：

$F_r = \frac{2\,865 \cdot P}{d \cdot n}$[daN] 适用于同步带驱动

$F_r = \frac{4\,775 \cdot P}{d \cdot n}$ [daN] 适用于V带驱动

公式中：P[kW]是在减速机输入端所需输入功率P_1,或输出端的输出功率P_2；n[min^{-1}]是输入速度n_1或输出速度n_2；d是带轮节圆直径。

径向载荷表中给出的值适用于，加在高速轴端中心线上的悬垂载荷情况，施力位置在距轴肩0.5e或0.5E处，(e,E=轴端长度)。如果在0.315e或0.315E处，表中值应该乘以1.25；如果施力位置在0.8e或0.8E处，乘以0.8。

9 – Radial loads[1] on high speed shaft end F_{r1}[daN] and low speed shaft end F_{r2}[daN]

Radial loads generated on the shaft end by a drive connecting right angle saft gear reducer and motor or right angle shaft gear reducer and machine must be less than or equal to those given in the relevant table. The radial load F_r,given by the following formula refers to most common drives：

$F_r = \frac{2\,865 \cdot P}{d \cdot n}$[daN] for toothed belt drive

$F_r = \frac{4\,775 \cdot P}{d \cdot n}$ [daN] for V– belt drive

where: P [kW] is power required at the input side (P_1)or at the output side (P_2)of the right angle shaft gear reducer. n[min^{-1}] is the speed at the input side(n_1) or at the output side(n_2), d [m] is the pitch diameter.

Radial loads given in the table are valid for overhung loads on centre line of shaff end, i.e. operating at a distance of 0.5 · e or 0.5 · E(e,E=shaft end length) from the shoulder. If they operate at 0.315 · e or 0.315 · E multiply by1.25; if they operafe at 0.8 · e or 0.8 · E multiply by 0.8

输入速度 n_1	减速机规格–Right angle shaft gear reducer size																				
	80			100			125			160			200			250			320		
	F_{r1}		F_{r2}	F_{r1}		F_{r2}	F_{r1}		F_{r2}	F_{r1}		F_{r2}	F_{r1}		F_{r2}	F_{r1}		F_{r2}	F_{r1}		F_{r2}
	$i \leq 2$	$i \geq 2.5$	2)	$i \leq 2$	$i \geq 2.5$	2)	$i \leq 2$	$i \geq 2.5$	2)	$i \leq 2$	$i \geq 2.5$	2)	$i \leq 2$	$i \geq 2.5$	2)	$i \leq 2$	$i \geq 2.5$	2)	$i \leq 2.5$	$i \geq 3.15$	2)
1400	53	33.5	85	85	53	132	132	85	212	212	132	335	335	212	530	530	335	850	850	530	1320
1120	56	35.5	90	90	56	140	140	90	224	224	140	355	355	224	560	560	355	900	900	560	1400
900	60	37.5	95	95	60	150	150	95	236	236	150	375	375	236	600	600	375	950	950	600	1500
710	67	42.5	106	106	67	170	170	106	265	265	170	425	425	265	670	670	425	1060	1060	670	1700
560	71	45	112	112	71	180	180	112	280	280	180	450	450	280	710	710	450	1120	1120	710	1800
450	75	47.5	118	118	75	190	190	118	300	300	190	475	475	300	750	750	475	1180	1180	750	1900
355	85	53	132	132	85	212	212	132	335	335	212	530	530	335	850	850	530	1320	1320	850	2120
280	90	56	140	140	90	224	224	140	355	355	224	560	560	355	900	900	560	1400	1400	900	2240
224	95	60	150	150	95	236	236	150	375	375	236	600	600	375	950	950	600	1500	1500	950	2360
180	106	67	170	170	106	265	265	170	425	425	265	670	670	425	1060	1060	670	1700	1700	1060	2650
140	112	71	180	180	112	280	280	180	450	450	280	710	710	450	1120	1120	710	1800	1800	1120	2800
112	118	75	190	190	118	300	300	190	475	475	300	750	750	475	1180	1180	750	1900	1900	1180	3000
≤90	132	85	212	212	132	335	335	212	530	530	335	850	850	530	1320	1320	850	2120	2120	1320	3350

1) 当有轴向载荷和径向载荷同时作用于轴端时，轴向载荷值不可超过表中径向载荷值的0.2倍，如果超过，请垂询我们。
2) 此数值仅适用于当低速轴位于伞齿的另一侧的情况，当低速轴与伞齿位于同侧时，或使用双伸低速轴时，请垂询我们。

1) An axial load of up to 0.2 times the value in the table is permissible, simultaneously with the radial load. if exceeded consult us.
2) Values valid for low speed shaft end on **opposite** side to bevel gear; for bevel gear side or double extension low speed shaft end consult us

重要：表格中列出的径向载荷值F_{r1}和F_{r2}在某些特定的工况下(如转向、负载的施力角度等)可能增加很多，如果需要，请咨询我们。

IMPORTANT：values tabulated for radial load F_{r1} and F_{r2} can increase considerably in certain instances (direction of rotation, angular position of load, etc.). **Consult** us if need be.

10 – 结构和操作细节

效率 η：

–2个齿轮的减速机： η=0.98； 3个齿轮的减速机： η=0.97；

过载

当转角减速机可能被用于承受较高的动态或静态过载时，需要校核以保证过载值不会超过 $2 \cdot M_{N2}$ (第7节)
过载通常会由以下情况产生：
– 满载启动（特别是在高惯量，低速比的情况下）；
– 制动；
– 冲击；
– 转角减速机的低速轴由于从动机的惯量过大而变成主动轴；
– 装机功率大于所需功率；
– 其它静态或动态的原因；

当无法量度过载值的大小时，请安装安全装置，以保证过载值不会超过$2 \cdot M_{N2}$

10 – Structural and operational details

Efficiency η：

– right angle shaft gear reducer with 2 gears 0.98,with 3 gears 0.97.

Overloads

When right angle shaft gear reducer is subjected to high static and dynamic overloads, the need arises for verifying that such overloads will always remain lower than $2 \cdot M_{N2}$ (ch.7).
Overloads are usually generated in case of：
– starting on full load (especially for high inertias and low transmission ratios)；
– braking;
– shocks;
– right angle shaft gear reducers in which the low speed shaft becomes driving member due to driven machine inertia;
– applied power higher than that required;
– other static or dynamic causes

Where no evaluation is possible, install safety devices which will keep values within $2 \cdot M_{N2}$.

10 – 结构和操作细节

启动力矩

在满载启动的时，(特别是高惯量低传动比的情况下)，需要校核2 · M_{N2} 不小于启动力矩，请使用以下公式：

$$M_2\,启动 = \left(\frac{M\,启动}{M_N}\ M_2\,可用 - M_2\,所需\right)\frac{J}{J+J_0} + M_2\,所需$$

公式中：
$\frac{M\,启动}{M_N}$：启动力矩与电机额定力矩的比值；
M_2所需：工作中实际需要使用到的扭矩；
M_2可用：根据电机功率推算出的输出扭矩
J_0：电机的转动质量；
J：其它外部机构相对于电机轴的总惯量（减速器，联轴器，从动机等），单位为kgm^2

通过刹车电机停止具有高运动能量(高惯性且高速度)的机器设备时

请用以下公式校核刹车力：

$$\left(\frac{Mf}{\eta}\ \cdot i + M_2\ \text{required}\right)\frac{J}{J+J_0} - M_2\ \text{required} \leqslant 2 \cdot M_{N2}$$

公式中:
Mf 为刹车电机的设定刹车力矩；其它符号意义见第1节。

10 – Structural and operational details

Starting torque

When starting on full load (especially for high inertias and low transmission rations) verify that **2 · M_{N2}** is equal to or greater than starting torque, by using the following formula:

$$M_2\ \text{start} = \left(\frac{M\ \text{start}}{M_N}\ M_2\ \text{available} - M_2\ \text{required}\right)\frac{J}{J+J_0} + M_2\ \text{required}$$

where:
$\frac{M\ \text{start}}{M_N}$ is the ratio between starting torque and motor nominal torque;
M_2 required is torque absorbed by the machine through work and friction;
M_2 available is output torque due to the motor nominal power;
J is the external moment of inertia (of mass) in kg m^2 (right angle shaft gear reducer, couplings, driven machine) referred to the motor shaft;
J_0 is the moment of inertia (of mass) of the motor.

NOTE: When seeking to verify that starting torque is sufficiently high for stating, take into account starting friction, if any, in evaluating M_2 required.

Stopping machines with high kinetic energy (high moments of) inertia combined with high speeds) with brake motor

Verify braking stress by means of the formula:

$$\left(\frac{Mf}{\eta}\ \cdot i + M_2\ \text{required}\right)\frac{J}{J+J_0} - M_2\ \text{required} \leqslant 2 \cdot M_{N2}$$

Where:
Mf is the braking torque setting; for other symbols see above and ch. 1.

转动惯量 (质量的) J_1 [kg m^2]

规格 Size	传动比/Transmission ratio						
	1	2	2.5	3.15	4	5	6.25
160	0.0074	0.0029	0.0028	0.0019	0.0011	0.0008	0.0005
200	0.0261	0.0101	0.0084	0.0058	0.0033	0.0024	0.0018
250	0.0770	0.0271	0.0247	0.0182	0.0097	0.0069	0.0049
320	0.2370	0.0921	0.0863	0.059	0.0326	0.0234	0.0161

Moment of inertia (of mass) J_1 [kg m^2]

转动惯量 J [kg m^2] 是SI系统的量度单位，在技术系统中，通常使用动量Gd^2 [kgfm^2]，其相当于4J，该转动惯量值是相对于高速轴的，对于低速轴的转动惯量为$J_2=J_1 \cdot i^2$。

The moment of inertia (of mass) J [kg m^2] is expressed, with the «SI System» unit of measure; in the Technical System it is usually replaced by the dynamic moment Gd^2 [kgf m^2] which is numerically equal to 4 · J.
The moment of inertia is referred to the high speed shaft. That referred to the low speed shaft is $J_2=J_1 \cdot i^2$

低速轴齿隙

低速轴齿隙（高速轴固定）的**大概值**如表所示，实际值可能随温度和结构不同而不同。

如果需要，可以提供低于标准值的齿隙。

1) 在距离低速轴中心1m 处的齿隙值，，可以将表中值乘以1000后得到。

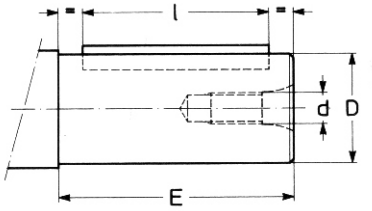
规格 Right angle shaft gear reducer size	齿隙[rad]1) Angular backlash[rad]1)	
	最小/min	最大/max
80	0.0040	0.0063
100	0.0036	0.0056
125	0.0032	0.0050
160	0.0028	0.0045
200	0.0025	0.0040
250	0.0022	0.0036
320	0.0020	0.0032

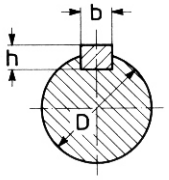
Low speed shaft angular backlash

A rough guide for low speed shaft angular backlash is given in the table (with high speed shaft held stationary). Values vary according to design and temperature.
Gear pairs with reduced backlash can be supplied on request.

1) At a distance of 1 m from the low speed shaft centre, angular backlash in mm is obtained multiplying the table value by 1 000.

轴端尺寸

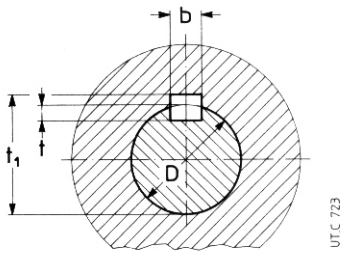




轴端尺寸– Shaft end

D Ø	轴长/Shaft end E1)	d Ø	平键/Parallel key b×h×l1)	键槽/Keyway b	t	t1)
14 J6	30	M6	5×5×25	5	3	16.2
16 j6	30	M6	5×5×25	5	3	18.2
19 j6	40	M6	6×6×36	6	3.5	21.7
24 j6	50 (36)	M8	8×7×45 (25)	8	4	27.2
28 j6	60 (42)	M8	8×7×45 (36)	8	4	31.2
32 k6	80	M10	10×8×70	10	5	35.3
38 k6	80 (58)	M10	10×8×70 (50)	10	5	41.3
48 k6	110 (82)	M12	14×9×90 (70)	14	5.5	51.8
55 m6	110	M12	16×10×90	16	6	59.3
60 k6	140 (105)	M16	18×11×110 (90)	18	7	64.4
70 m6	140	M16	20×12×125	20	7.5	74.9
75 k6	140 (105)	M16	20×12×125 (90)	20	7.5	79.9
95 k6	(130)	M20	25×14×(110)	25	9	100.4

Shaft end



空心低速轴– Hollow low speed shaft

轴孔 Hole D0 ØH7	平键 Parallel key b×h×l*	键槽/Keyway b	t	t1
20	6×5$^{2)}$×70	6	3$^{2)}$	22.2$^{2)}$
25	8×6$^{2)}$×90	8	3.5$^{2)}$	27.7$^{2)}$
32	10×8×110	10	5	35.3
42	12×8×140	12	5	45.3
55	16×10×160	16	6	59.3
70	20×12×200	20	8$^{2)}$	74.3$^{2)}$
90	25×14×250	25	9	95.4

* 建议长度
1) 括号中值适用于短轴；
2) 非标准值.
* Recommended length
1) Values in brackets are for short shaft end.
2) Values **not** to standard.

11 – 安装和维护

概述

请确保减速机的安装平面平整，水平，且足够大，可以保证减速机安装的稳固和防振（需要充分考虑减速机所传递的所有力，包括质量，扭矩，以及轴向和径向力）。

请在定位减速机时，在其周围留出足够的空间，以保证冷却（特别是在风扇侧）。

请避免存在：任何的阻碍空气流动的物体；任何的可能影响到减速机周围冷却空气温度的热源；空气流动不充分等制约减速机散热的任何因素。

稳定安装减速机，避免受到震动。

如果必要，请在减速机受到外力作用的情况下，使用定位销定位。

在固定减速机以及机器时，建议使用螺纹胶，涂在紧固螺栓上以及配合表面上。

当减速机安装在室外时,或环境恶劣时,请使用防腐漆保护减速机。可以在外露件上涂防水的润滑脂（特别是在旋转的油封座以及相连位置）。

减速机的保护应该是充分的，足以使其免受日照和极端恶劣天气的影响。当有任何的轴处于竖直状态时，更加必要注意保护以免受天气的影响。

当环境温度高于 40℃或低于0℃时，请咨询我们。

如果过载的时间较长，或者减速机会受到重冲击或卡死的危险，请安装电机保护、力矩限制器、液力耦合器、安全耦合器、控制系统或其它的适当装置，以保护减速机。

警告：轴承寿命，轴和联轴器等的良好运行取决于轴与轴之间的同轴精度。请仔细的将电机与减速机和从动机的轴对中（如果必要，请使用垫片调整）。请尽量使用弹性联轴器。

任何的润滑质泄露，都会对减速机造成严重伤害，请尽量频繁检查润滑介质的量，或使用检测装置检查油量。

在污染严重的环境中，请使用适当的防护措施，以免润滑油经油封等位置被污染。

安装其它零件到轴端

通过平键连接到减速机轴端的零件的轴孔的公差建议为H7；对于轴径D≥55 mm的高速轴，如果负载较轻且均衡， 可以使用G7公差；对于低速轴，当负载较重而不稳定时， 必须使用K7公差。其它细节请见第10节《轴端尺寸》。

在安装前，请仔细彻底清洁所有配合表面，涂润滑油以免表面划伤及摩擦腐蚀。

装配和拆卸轴端零件，请务必使用拉马或螺杆进行.安装配合为H7/m6 和 K7/j6的零件时，请将零件预热到80–100℃。

润滑

减速机均为油浴式润滑。规格80–125的减速机通过合成润滑油或合成润滑脂保证终身润滑。

轴承润滑方式：除了顶部的轴承是通过泵润滑或脂终身润滑(是否带NILOS挡油环，根据转速而定)外，均为油浴式润滑式或溅油式润滑。

油浴式润滑的减速机在供货时不提供预装润滑油。在减速机使用之前，需要注入矿物润滑油(AGIP Blasia, ARAL Degol BG, BP–Energol GR–XP, ESSO Spartan EP, IP Mellana oil, MOBIL Mobilgear 600, SHELL Omala,TEXACO Meropa, TOTAL Carter EP, Great wall)到指定的油位，所注润滑油须满足下表中的黏度值要求。

当用户需要较长的换油间隔(长时间不需换油)，或较大的可用环境温度变化范围，或需要降低润滑油的实际温度时，请使用合成润滑油。(with polyglycol basis: KLUBER KlUbersynt GH6 ..., MOBILGlygoyle, SHELL Tivela oil with polyalphaolefjnes basis, always suggested. especiallyforsizes≥250：AGIPBlasiaSX CASTROLTrl–bol11510, ELF Reductelf SYNTHESE, ESSO Spartan SEP, KLOBER K1ubersynth Eg4, MOBIL SHC,Great wall)，黏度值请见下表。

11 – Installation and maintenance

General

Be sure that the structure on which right angle shaft gear reducer is fitted is plane, levelled and sufficiently dimensioned in order to assure fitting stability and vibration absence, keeping in mind all transmitted forces due to the masses, to the torque, to the radial and axial loads.

Position the right angle shaft gear reducer so as to allow a free passage of air for cooling (especially at fan side).

Avoid: any obstruction to the air–flow; heat sources near fhe right angle shaft gear reducer that might affect the temperature of cooling–air and of right angle shaft gear reducer for radiation; insufficient air recycle or any other factor hindering the steady dissipation of heat.

Mount the right angle shaft gear reducer so as not to receive vibrations.

When external loads are present use pins of locking blocks,if necessary.

When fitting right angle shaft gear reducer and machine it is recommended to use **locklng adhesives** such as LOCTITE on the fastening screws (also on flange mating suraces).

For outdoor installation or in a hostile environment protect the right angle shaft gear reducer with anticorrosion paint. Added protection may be afforded by water–repellent grease (especially around the rotary seating of seal rings and the accessible zones of shaft end).

Right angle shaft gear reducers should be protected wherever possible, and by whatever appropriate means, from solar radiation and extremes of weather; weather protection **becomes essential** when high or low speed shafts are vertically disposed.

For ambient temperatures greater than 40℃ or less than 0℃ consult us.

If overloads are imposed for long periods of time, or if shocks or danger of jamming are envisaged, then motor–protections, electronic torque limiters, fluid couplings, safety couplings, control units or other suitable devices should be fitted.

Warning: Bearing life, good shaft and coupling running depend on alignment precision between the shafts, Carefully align the right angle shaft gear reducer with the motor and the driven machine (with the aid of shims if need be), interposing flexible couplings whenever possible.

Whenever a leakage of lubricant could cause heavy damages, increase the frequency of inspections and/or envisage appropriate centrol devices.

In polluting surroundings, take suitable precautions against lubricant contamination through seal rings or other.

Fitting of components to shaft ends

It is recommended that the bore of parts keyed to shaft ends is machined to H7 tolerance; G7 is permissible for high speed shaft ends D≥55 mm, provided that load is uniform and light; for low speed shaft ends tolerance must be **K7** when load is not uniform and light. Other «details are given in the » Shaft end table(ch. 10).

Before mounting, clean mating surfaces thoroughly and lubricate against seizure and fretting corrosion

Assembly and removal operations should be carried out with **pullers** and **jacking screws** using the tapped hole at the shaft butt–end; for H7/m6 and K7/j6 fits it is advisable that the part to be keyed is preheated to a temperature of 80 ÷ 100℃

Lubrication

Gear pairs are oil–bath lubricated;« for life»lubrication with synthetic grease or oil only for sizes 80 ... 125. Bearings are either oil–bath or splash lubricated,with the exception of top bearings which are lubricated by a pump or,« for life»grease–lubricated, as in grease–lubricated right angle shaft gear reducers(withor without NILOS rings according to running speed)

Oil–lubricated right angle shaft gear reducers are supplied **without oil;** before putting into service, fill to the specified level with **mineral oil**(AGIP Blasia, ARAL Degol BG, BP–Energol GR–XP, SSO Spartan EP, IP Mellana oil, MOBIL Mobilgear 600, SHELL Omala, TEXACO Meropa, TOTAL Carter EP, Great wall)having the ISO viscosity grade given in the table.

When it is required to increase oil change interval (《for life》), the ambient temperature range, and/or reduce oil temperature, use **synthetic oil** (with polyglycol basis: KLUBER KlUbersynt GH6 ..., MOBIL Glygoyle, SHELL Tivela oil with polyalphaolefjnes basis, always suggested. especiallyforsizes≥250：AGIPBlasiaSX CASTROLTrl–bol11510, ELF Reductelf SYNTHESE, ESSO Spartan SEP, KLOBER K1ubersynth Eg4, MOBIL SHC,Great wall) having ISO viscosity grade as indicated in the table.

11 – 安装和维护

润滑

ISO 运动黏度等级

40度时的平均运动黏度

输出速度 n_2 min^{-1}	环境温度[1)][℃] 矿物润滑油 oil 0 – 20	10 – 40	合成润滑油 *oil* 0 – 40
> 710	150	150	150
710–280	150	220	220
280–90	220	320	320
< 90	320	460	460

1) 环境温度允许在±10℃（合成润滑油为20℃）内变化。

重要：当油温较低（40–60℃）时，建议使用较高黏度的润滑油，将润滑油的黏度提高1或2个级别。

当减速机连续运转，输出速度大于710rpm，且有一个齿轮**完全浸没**在润滑油中时，建议使用合成润滑油。

换油间隔大体说明如下表，假设为无污染环境。当应用于重冲击载荷情况下时，表中值应减半。

润滑油温度 [℃]	换油间隔[小时] 矿物润滑油	合成润滑油
≤65	8 000	25 000
65 – 80	4 000	18 000
80 – 95	2 000	12 500
95–110	–	9 000

绝不要混合不同品牌的润滑油；如果要更换成不同的，请事先对减速机进行彻底的清洗。

密封圈：耐用期取决与速度，温度，环境条件等，根据大概情况，耐用期可以是3150—25 000小时。

警告：规格为100 ... 360的减速机，在旋开销盖之前(符号-◇-)，要等待机器完全冷却下来后，小心的打开。

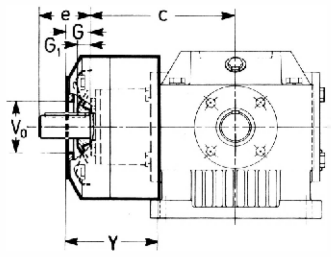
12 – 附件及非标设计

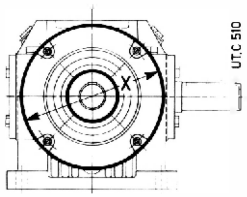
风扇冷却

下表中标出的转角减速机规格，双轴上都可以安装冷却风扇。尺寸**e**和**c**见第8节。

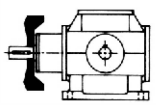
结构形式为 **... P, ... T, ... R, ... V, ... S, ... Z** 的减速机，不能在地脚侧的轴上安装风扇。

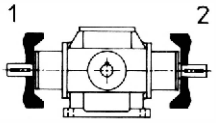
冷却空气的温度不能超过环境温度。

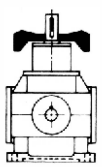




规格为200...320的转角减速机，可以使用独立冷却系统进行冷却，如果需要，请咨询我们。







11 – Installation and maintenance

Lubrication

ISO viscosity grade

Mean kinematic viscosity [cSt] at 40℃

Speed n_2 min^{-1}	Ambient temperature[1)][℃] mineral oil 0 ÷ 20	10 ÷ 40	synthetic oil 0 ÷ 40
> 710	150	150	150
710 ÷ 280	150	220	220
280 ÷ 90	220	320	320
< 90	320	460	460

1) Peaks of 10℃ above and 10℃ (20℃ for synthetic oil) below the ambient temperature range are acceptable.

IMPORTANT.When oil temperature is low (40 ÷ 60℃)it is advisable to increase the values given in the table of one or two ISO viscosity degrees.

Whenever there is continuous duty with $n_2 \geqslant 71\ 0\ min^{-1}$and where a gear(or pinion), due to the particular mounting position,is **completely plunged** in oil, the use of synthetic oil is recommended.

An overall guide to **oil–change intervel** is given in the table and assumes pollution–free surroundings. Where heavy overloads are present, halve the values.

Oil temperature [℃]	Oil–change interval [h] Mineral oil	synthetic oil
≤65	8 000	25 000
65 ÷ 80	4 000	18 000
80 ÷ 95	2 000	12 500
95 ÷ 110	–	9 000

Never mix different makes of synthetic oil; if oil–change involves switching to a type different from that used hitherto, then give the gear reducer a thorough clean–out.

Seal rings: duration depends on several factors such as dragging speed, temperature, ambient conditions, etc.; As a rough guide; it can vary from 3 150 to 25 000 h.

Warning: for right angle shaft gear reducers sizes 160 ... 320, before unscrewing the filler plug with valve(simbol -◇-) wait until the unit has cooled and then open with caution.

12 – Accessories and non–standard designs

Fan cooling

Right angle shaft gear reducers of size indicated in the table can be supplied fitted with fan on both right speed shaft ends. See ch. 8 for dimensions **e** and **c.**

Designs **... P, ... T, ... R, ... V, ... S, ... Z** can not have the fan fitted on high speed shaft end on casing foot side.

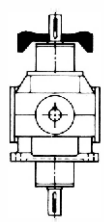
Temperature of cooling air must not exceed ambient temperature.

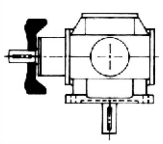
规格 Size	G	G_1	V_0 ⌀ 1)	X ⌀	Y
160(*i*≤ 2)	31	15	90	198	128
200(*i*≤ 3,15)	38	25	110	262	135
250	52	32	70	325	174
320	62	40	90	402	219

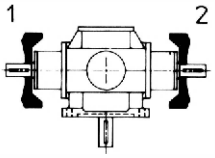
1) 该尺寸可能增加到0.32X。

1) This diameter may be widened to max 0.32X.

For right angle shaft gear reducers sizes 200 ... 320 forced cooling by independent cooling unit with heat exchanger are possible; if required, consult us.







12 – 附件及非标设计

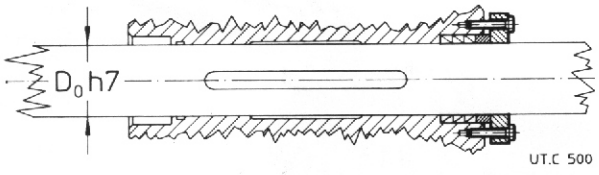
其它

– **独立冷却系统，带油/气 或 油/水 散热器，**用于强制冷却和润滑；
– 增速操作；
– 伞齿轮副齿隙可**减小**；
– 规格为125...320的减速机可以提供通长输出轴（见下图）–**带平键和缩紧环**；

12 – Accessories and non–standard designs

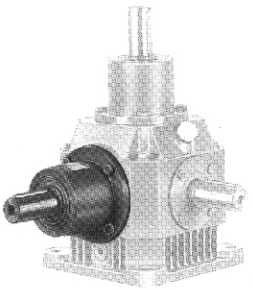
Miscellaneous

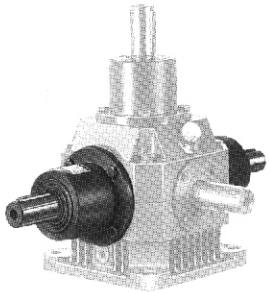
– **Independent cooling unit, made up of oil/air or oil/water heat exchanger** for forced cooling and lubrication.
– speed increasing operation.
– Bevel gear pair with **reduced backlash.**
– Right angle shaft gear reducers sizes 125 ... 320 – for through shafts ⌀ D_0 (see drawing)–fitted with **key and locking rings.**

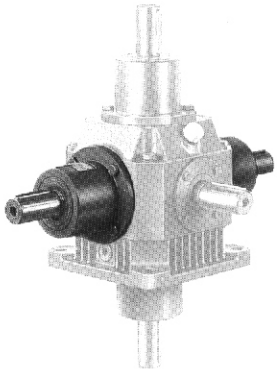


– 结构形式为 ... **E**, ... , ... **Z**(*i*≥*2*) 且带双高速轴的减速机，双轴可以成 **90**° 和/ 或 **270**° (见下图.);

– design ... **E**, ... , ... **Z**(*i*≥2) with double extension high speed shaft at **90**° and/or **270**° (see fig.);

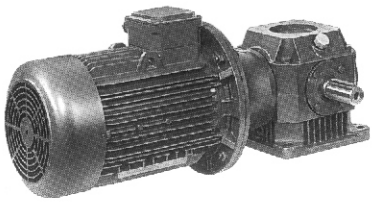


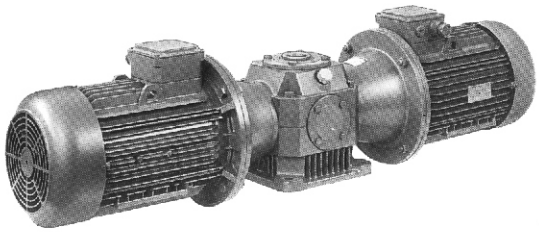


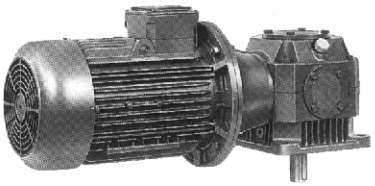


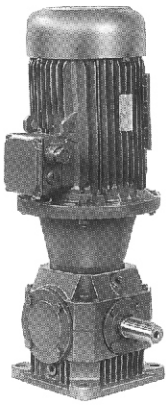
– **规格为80...160（速比i=1，2，3.15，4）的减速机，**可以联接80...180M的电机，有关联接尺寸和最大可连接电机法兰，请见下表：

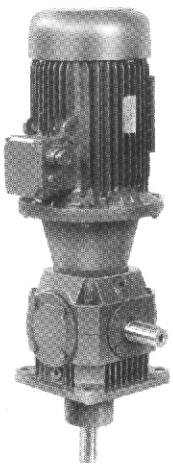
– **Right angle shaft gearmotors** sizes **80 ... 160** (*i*= 1, 2, 3.15, 4) with motors sizes 80 ... 180M (see picture); for motor coupling dimensions and maximum permissible motor size see following table.











减速机规格 Right angle shaft gear reducer size	传动比 Transmission ratio *i*	电机规格 Motor size 1)	主要连接尺寸 Main coupling dimensions 轴端尺寸 Shaft end Ø D×E	法兰尺寸 Fange ØP B5
80	3.15, 4	80	19× 40	200[1)]
	1, 2, 3.15, 4	90	24× 50	200
	1, 2,	100*, 112M*	24× 50	200
100	3.15, 4	90	24× 50	200
	1, 2, 3.15, 4	100*, 112M	28× 60	250
	1, 2,	132M*	28× 60	250
125	2, 3.15, 4	100, 112	28× 60	250
	1, 2, 3.15, 4	132 M	38× 80	300
	1, 2,	132 LG	38× 80	300
160	2, 3.15, 4	132	38× 80	300
	1, 2, 3.15, 4	160	42×110	350
	1, 2,	180 M	48×110	350

1) 同时适用于 B5A 电机连接方式(Ø160)。
* B5R 电机连接方式(连接尺寸同小一号电机尺寸）

1) Also available mounting position B5A (Ø160).
* Mountion position B5R (coupling dimensions of smaller motor size).

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