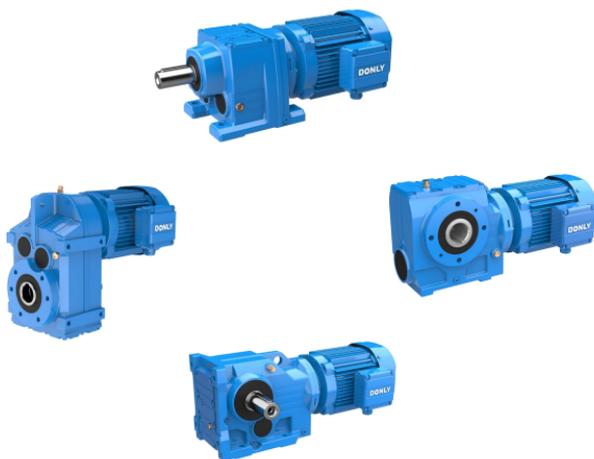


**DONLY TRANSMISSION**

# 使用说明书



R../F../K../S..系列减速机

版本 Edition 2025

**DONLY**

驱动无限可能

**DONLY TRANSMISSION**

**DONLY**

驱 动 无 限 可 能

# 目录

目录	1
1 重要提示	3
2 安全说明	5
3 减速器的构造	9
3.1 R 系列斜齿轮减速器的构造	9
3.2 F 系列平行轴-斜齿轮减速器的构造	10
3.3 K 系列斜齿轮-锥齿轮减速器的构造	11
3.4 S 系列斜齿轮-蜗轮蜗杆减速器的构造	12
4 机械安装	13
4.1 所需工具/ 辅助材料	13
4.2 安装准备工作	13
4.3 安装注意事项	14
4.4 带有实心轴的减速器	17
4.5 轴装式减速器的扭矩臂	20
4.6 带键槽或花键的空心轴减速器	22
4.7 带锁紧盘的轴装式减速器	29
4.8 安装膨胀油箱	31
4.9 为 AM、SF 过渡接口安装电机	32
5 调试	34
5.1 检查油位	34
5.2 调试斜齿轮- 蜗轮蜗杆减速器	34
5.3 调试斜齿轮减速器、平行轴-斜齿轮以及斜齿轮-锥齿轮 减速器	34
6 检查与维护	35
6.1 检查与维护周期	35
6.2 润滑剂更换时间间隔	36
6.3 减速器检查/ 维护作业	36

7 运转故障 .....	39
7.1 减速器故障 .....	39
8 安装方式 .....	39
8.1 关于安装方式的一般说明 .....	39
8.2 关于安装方式图的注意事项 .....	41
8.3 R 系列 斜齿轮减速电机的安装方式 .....	42
8.4 RX 系列斜齿轮减速电机的安装方式 .....	44
8.5 F 系列平行轴-斜齿轮减速电机的安装方式 .....	45
8.6 K 系列斜齿轮--锥齿轮减速电机的安装方式 .....	48
8.7 S 系列斜齿轮-蜗轮蜗杆减速电机的安装方式 .....	54
9 润滑剂 .....	60
9.1 滚动轴承润滑脂 .....	60
9.2 齿轮润滑油 .....	60
9.3 齿轮润滑油加注量 .....	63

# 1 重要提示

## 安全提示和警告提示

请务必注意本操作手册中的安全提示和警告提示！

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**有电危险。**  
可能产生的后果：死亡或者严重伤害。



**危险。**  
可能产生的后果：死亡或者严重伤害。



**危险情况。**  
可能产生的后果：轻微伤害。

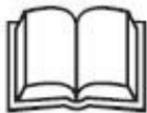


**有害情况。**  
可能产生的后果：损害传动装置和环境。



使用建议和有用的信息。

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遵守本手册的规定是以下情况的前提：

- 无故障运行
- 满足质量缺陷索赔要求

因此在使用传动装置进行工作之前，请您首先阅读本操作手册！

本操作手册包含重要的维护提示。因此，请将操作手册保管在靠近减速器的地方。



· 当更换安装方式时，润滑剂添加量和透气阀的位置必须作相应的调整。

· 请注意“机械安装”章节中的说明！

## 废弃物处理



请遵守现有规定：应根据废弃电机的情况和现有规定进行废物处理，例如作为：

· 废铁屑：

- 外壳

- 齿轮

- 轴

- 滚动轴承

- 灰口铸铁（当不需要特殊的收集时）

· 蜗轮部分地采用有色金属制成。请您相应地清洗蜗轮。

· 收集废油并且按照规定进行处理。

## 2 安全说明

### 前言

下列安全说明主要涉及减速器的使用。当使用**减速电机**时，还要注意电机操作手册中的有关安全说明。

**也请重视该操作手册各个章节中的补充性安全提示。**

### 概述

减速电机，减速器以及电机在运转中以及停止运转后有：

- 带电部件
- 运动部件
- 发热表面

只有具有特殊技能的专业人员才允许进行以下的操作：

- 运输
- 储存
- 安装/ 装配
- 连接
- 调试
- 维护
- 检修

请您注意以下的提示以及文件内容：

- 操作手册附件以及电路图
- 减速器/ 减速电机上的警告和安全标志牌
- 有关设备的特别规定和要求
- 有关安全和事故防范的国家/ 地区性规定

**以下情形会产生严重人身伤害和物质损失：**

- 使用不当

- . 安装或者操作错误
- . 违反规定拆除必要的防护罩或者机壳

## 根据规定使用

DONLY 的减速电机/ 减速器被指定为工业化的设备。它符合有效的标准以及规定。在铭牌以及文档中您可以找到它的技术数据和允许使用说明。

请务必遵守所有规定！

## 运输



在收货之后请立即检查有无运输损伤。如有损伤请立即告知运输公司。您有可能收到不能使用的设备。

拧紧运输吊环。这些吊环按照减速电机/ 减速器的重量进行设计。不允许再添加另外的负荷。

已经安装好的吊环螺栓符合 ISO 标准的规定。原则上要遵守标准中所注明的负荷和规定。如果在减速电机上安装有两个吊环或者吊环螺栓，则在搬运时必须在两个吊环上进行吊装。根据 ISO 标准的规定，吊装附件的拉力方向不得超过 45° 斜角。

如有需要的话，应使用适当的、有足够承载力的运输工具。在进行调试之前，要拆除现有的运输紧固件。

## 减速器长期存放

“长期存放”型减速器：

. 加注有符合安装方式的矿物油(CLP)和合成油(CLP HC)。请您在投入使用之前检查油位（参见“检查/ 维护”一章中的“检查/ 维护作业”）。

如果要长期存放，请您注意下列表格中列出的存放条件：

气候带	包装 <sup>1)</sup>	存放地点	存放时间
温带（欧洲， 美国，加拿大， 中国和俄罗斯， 热带地区除外）	干燥剂和湿度指示器焊接在 塑料薄膜内。	有顶棚，防雨雪，无震动。	在定期检查包装和湿度指示器 的情况下，最多三年 (相对湿度 < 50%)。
	打开	有顶棚且密闭，温度和湿度恒定 (5 °C < $\theta$ < 60 °C, < 50% 相对湿度) 不得有骤然温度变化，使用滤清器进行有控 制的通风（无污染和灰尘）。不得有腐蚀性蒸汽， 不得有震动。	在定期检查的情况下，两年以 及更长时间。在进行检查时， 应检查清洁度和机械损伤。 检查防锈层是否完好。
热带（亚洲， 非洲，中/南美洲， 澳大利亚， 新西兰 温带地区除外）	包装于包装箱中， 干燥剂和湿度指示器焊接 在塑料薄膜内。 通过化学处理防止虫 咬和发霉。	有顶棚，防雨淋，无震动。	在定期检查包装和湿度指示器 的情况下，最多三年 (相对湿度 < 50%)。
	打开	有顶棚且密闭，温度和湿度恒定 (5 °C < $\theta$ < 60 °C, < 50% 相对湿度) 不得有骤然温度变化，使用滤清器进行有控制的通 风（无污染和灰尘）。不得有腐蚀性蒸汽，不得有 震动。防止虫咬。	在定期检查的情况下，两年以 及更长时间。在进行检查时， 应检查清洁度和机械损伤。 检查防锈层是否完好。

1) 必须由一家经验丰富的包装公司使用专用包装材料进行包装。

## **安装 / 装配**

注意“机械安装”章节中的警示信息！

## **调试/ 运行**

请您在没有联接的状态下检查转向是否正确。其间请您注意转动过程中的异常摩擦噪声。

作试运行时如果没有传动部件，应注意键是否牢靠。即使是试运行也不能让监测装置和保护装置失去作用。

与正常运行状态相比，如果出现某些变化（例如温升、噪声、振动），在有疑问的情况下必须关闭减速电机。必须查明原因，有必要的話应与 DONLY 公司联系。

## **检查/ 维护**

请注意“检查与维护”一章中的提示！

### 3 减速器的构造



下列插图均是原理图。这些插图仅是对零部件清单的补充。根据减速器规格和设计型号的不同，可能会有偏差！

#### 3.1 R 系列斜齿轮减速器的构造

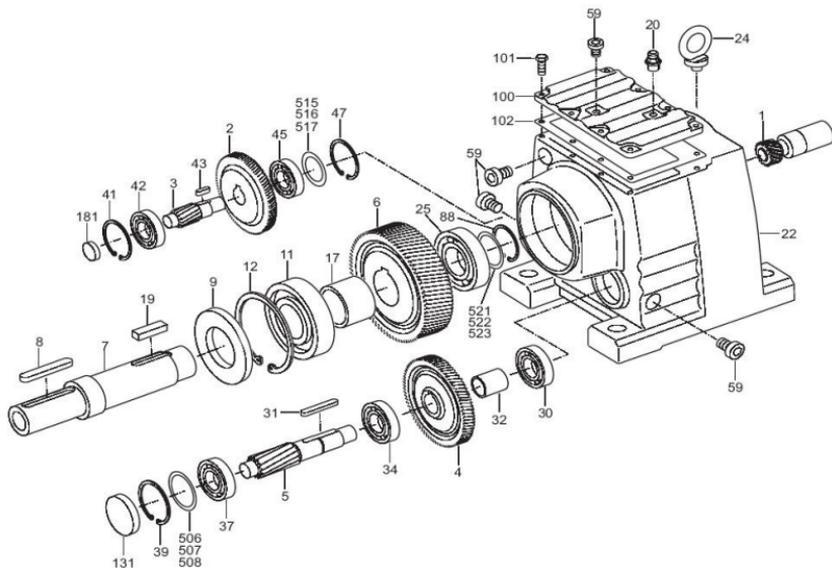


图 1: 斜齿轮减速器的构造原理

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**图例**

1 小齿轮	19 键	42 滚动轴承	507 垫圈
2 齿轮	20 排气阀	43 键	508 垫圈
3 主动齿轮轴	22 减速器箱体	45 滚动轴承	515 垫圈
4 齿轮	24 吊环螺栓	47 卡环	516 垫圈
5 主动齿轮轴	25 滚动轴承	59 螺丝堵	517 垫圈
6 齿轮	30 滚动轴承	88 卡环	521 垫圈
7 输出轴	31 键	100 减速器外盖	522 垫圈
8 键	32 间隔衬套	101 六角头螺栓	523 垫圈
9 轴密封圈	34 滚动轴承	102 密封垫	
11 滚动轴承	37 滚动轴承	131 堵头	
12 卡环	39 卡环	181 堵头	
17 间隔衬套	41 卡环	506 垫圈	



### 3.3 K 系列斜齿轮-锥齿轮减速器的构造

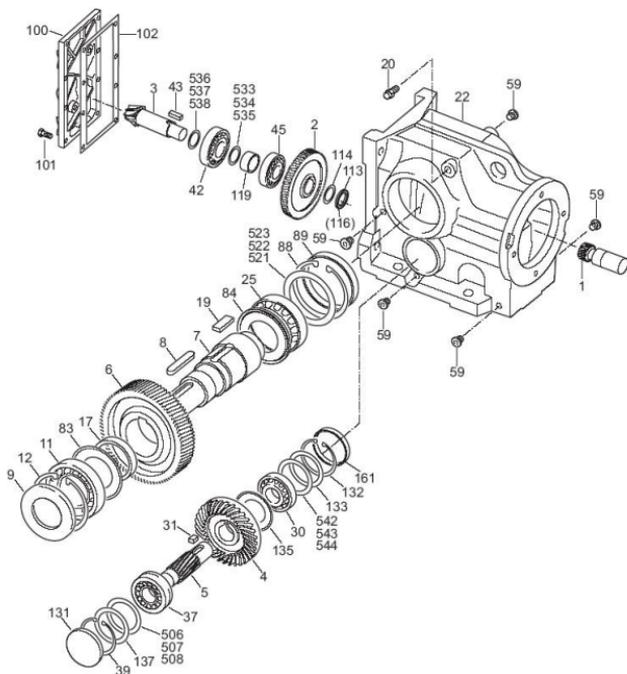


图 3: 斜齿轮-伞齿轮减速器的构造原理

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#### 图例

1 小齿轮	25 滚动轴承	102 粘接剂和密封剂	522 垫圈
2 齿轮	30 滚动轴承	113 带槽螺帽	523 垫圈
3 主动齿轮轴	31 键	114 弹簧垫圈	533 垫圈
4 齿轮	37 滚动轴承	116 螺纹保护	534 垫圈
5 主动齿轮轴	39 卡环	119 间隔衬套	535 垫圈
6 齿轮	42 滚动轴承	131 堵头	536 垫圈
7 输出轴	43 键	132 卡环	537 垫圈
8 键	45 滚动轴承	133 垫圈	538 垫圈
9 轴密封圈	59 螺丝堵	135 Nilos 环	542 垫圈
11 滚动轴承	83 Nilos 环	161 堵头	543 垫圈
12 卡环	84 Nilos 环	506 垫圈	544 垫圈
17 间隔衬套	88 卡环	507 垫圈	
19 键	89 堵头	508 垫圈	
20 排气阀	100 减速器外盖	521 垫圈	
22 减速器箱体	101 六角头螺栓	521 垫圈	

### 3.4 S 系列斜齿轮-蜗轮蜗杆减速器的构造

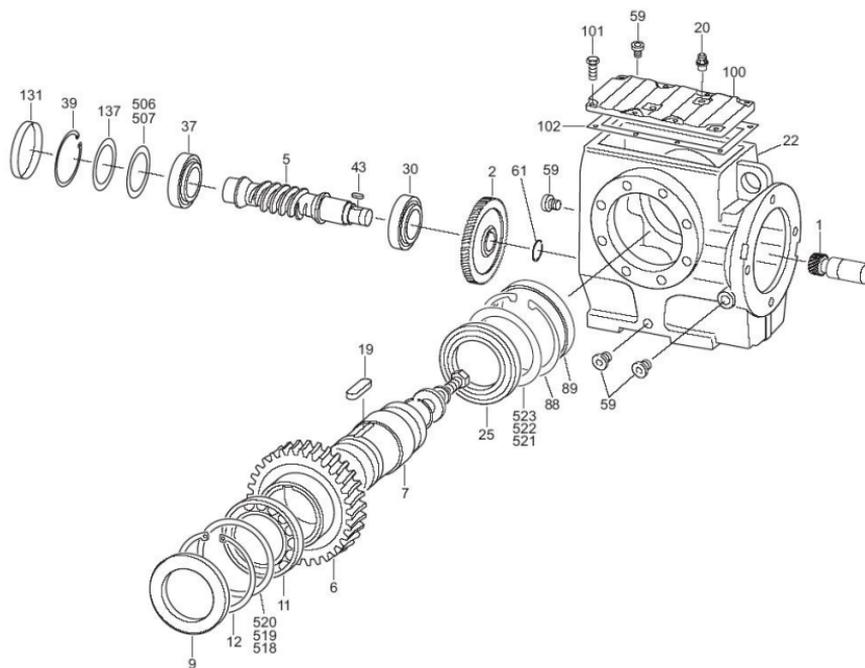


图 4：斜齿轮-蜗轮蜗杆减速器的构造原理

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#### 图例

1	小齿轮	20	排气阀	88	卡环	518	垫圈
2	齿轮	22	减速器箱体	89	堵头	519	垫圈
5	蜗杆	25	滚动轴承	100	减速器外盖	520	垫圈
6	蜗轮	30	滚动轴承	101	六角头螺栓	521	垫圈
7	输出轴	37	滚动轴承	102	橡胶密封垫	522	垫圈
9	轴密封圈	39	卡环	131	堵头	523	垫圈
11	滚动轴承	43	键	506	垫圈		
12	卡环	59	螺丝堵	507	垫圈		
19	键	61	卡环				

## 4 机械安装

### 4.1 所需工具/ 辅助材料

- . 一套扳手
- . 扭力扳手，用于
  - 锁紧盘
  - 电机适配器
  - 带有定心边缘的外盖
- . 套装夹具
- . 可能需要的校正元件（垫片、间隔环）
- . 用于输入/ 输出部件的紧固材料
- . 润滑剂
- . 操作螺丝防松装置（采用带定位孔的输入轴端盖时）的工具
- . 所有的标准部件均不是供货的组成部分

### 装配允差

轴端	法兰
直径误差根据 ISO 标准. <ul style="list-style-type: none"><li>. 对于<math>\leq 50</math> mm 的实心轴，ISO k6</li><li>. 对于<math>&gt;50</math> mm 的实心轴，ISO m6</li><li>. 对于空心轴，ISO H7</li></ul>	止口允差根据 ISO 标准规定 <ul style="list-style-type: none"><li>. 止口直径<math>\leq 230</math> mm，ISO j6</li><li>. 止口直径 <math>&gt; 230</math> mm，ISO h6</li></ul>

### 4.2 安装准备工作

请您检查，以下几点要求必须得到满足：

- . 减速电机铭牌上的规定与电源一致。
- . 驱动装置没有损伤( 没有因运输或者存储而损伤)。
- . 确认下列规定已得到满足：
  - **对于标准减速器：**

环境温度必须与“润滑剂”一章中相应的润滑剂表相一致（参见标准规范）。



减速电机不允许在以下环境条件下进行安装：

- 易爆环境中
- 油
- 酸性腐蚀环境下
- 气体
- 水蒸汽
- 在放射线环境中

- 用户可按自己的要求进行定制：

减速电机的配置与环境温度条件相关。

- 对于斜齿轮- 蜗轮蜗杆减速器：

不允许存在较大的惯性扭矩，大的惯性扭矩会使减速器在制动时承受过量的负荷。

注意 $\eta'$ (反向驱动) =  $2-1/\eta < 0.5$  时自锁。

· 输出轴和法兰表面必须彻底清除掉防锈剂、污染物或者类似脏物。必须使用常用的溶剂。不得让溶剂进入到轴密封环的密封唇上，否则会损坏材料！

· 在腐蚀性的环境条件请保护好工作轴端面的轴密封圈以防破损。

### 4.3 安装注意事项

减速器或减速电机只能按其给定的安装方式进行装配与安装。

支承结构必须满足以下特性：

- 平稳
- 防振
- 刚性好，不发生扭曲

地脚和法兰安装设计中所允许的最大平整度偏差（关于参考值，参见 ISO 标准）：

- . 减速器规格 ≤67: 最大 0.4 mm
- . 减速器规格 77 ~ 107: 最大 0.5 mm
- . 减速器规格 127 ~ 147: 最大 0.7 mm
- . 减速器规格 157 ~ 187 最大 0.8 mm

安装时不要将外壳地脚和安装法兰相互卡紧。注意减速机轴允许承受的径向拉力和轴向拉力（参见产品选型手册）！

请您采用强度等级为 8.8 的螺栓来坚固安装减速电机。

请您采用强度等级为 10.9 的螺栓来坚固安装以下的减速电机：

RF37，法兰直径 $\phi$ 120 mm；

RF47，法兰直径 $\phi$ 140 mm；

RF57,，法兰直径 $\phi$ 160 mm ；

FF/FAF77、KF/KAF77，法兰直径 $\phi$ 250 mm ；

RF147，法兰直径 $\phi$ 450 mm；

RF167，法兰直径 $\phi$ 550 mm

油位控制螺塞和放油螺塞以及透气阀必须容易进行检修！

在此情况下请您检查规定的与安装方式相适应的注油润滑方式（参见“润滑剂”/“齿轮润滑油加注量”章节或者铭牌上的说明）。工作时，必须给减速器按要求加注足量的润滑油。

由于安装方式的不同，油标可能有少许的偏差，这是在许可的公差范围内。

**当更换安装方式时，润滑剂加注量和透气阀的位置必须作相应的调整。**



在改变 M5、M6 状态下的 K 型减速器的安装方式或者在此安装方式下进行调整时，请您咨询 DONLY 公司的客户服务部。

在改变 M2、M3 状态下的 S47~S97 的安装方式或者在此安装方式下进行调整时，请咨询 DONLY 公司客户服务

部。

在改变 M2 状态下的 R 系列减速器的安装方式或者在此安装方式下进行调整时，请咨询 DONLY 公司客户服务部。

为了防止电化学腐蚀，请您在减速器与执行机械部件之间采用 2~3 毫米厚塑料材料隔板进行隔离。采用的塑料材料的泄露电阻值必须  $< 10^9 \Omega$ 。电化学腐蚀可能在不同的金属物质如铸铁与不锈钢之间发生。请为固定螺钉同样配置塑料材质的垫片！减速器箱体另外利用电机上的接地螺栓进行连接接地。

### 安装在潮湿场所或者户外

如果在潮湿场所或者户外使用，就需提供防腐蚀设计规格的减速器。如果发现油漆剥落（例如在透气阀上），就必须进行修补。将电机安装到减速机时在法兰盘平面须采用合适的密封胶，例如乐泰 207 进行密封。

### 减速器的通气

以下减速器无需通气处理：

· 安装方式 M1, M3, M5 以及 M6 中的 R17、R27 以及 F27  
DONLY 公司为其它所有减速器供应已带有合适的、安装好并处于良好状态的透气阀。

例外：

1. DONLY 公司提供以下带有预定排气孔螺丝堵的减速器：

- 长期存放的减速器
- 可能的灵活结构
- 倾斜位置安装的减速器

透气阀随附件放置在一起。启动减速器前请以随机提供的透气阀换下螺丝堵。

2. DONLY 公司为需要在安装面上进行排气的**减速器**提供一个塑料袋

装的透气阀。

3. DONLY 公司可提供不带透气阀的全封闭结构的减速器。

## 透气阀的激活

通常来说透气阀在出厂以后就已经处于可工作状态。如果不是这种情况，就必须在使用减速器之前将透气阀的运输固定装置去除掉！

1. 附有运输固定装置的排气阀

2. 去掉运输固定装置

3. 已经激活的排气阀



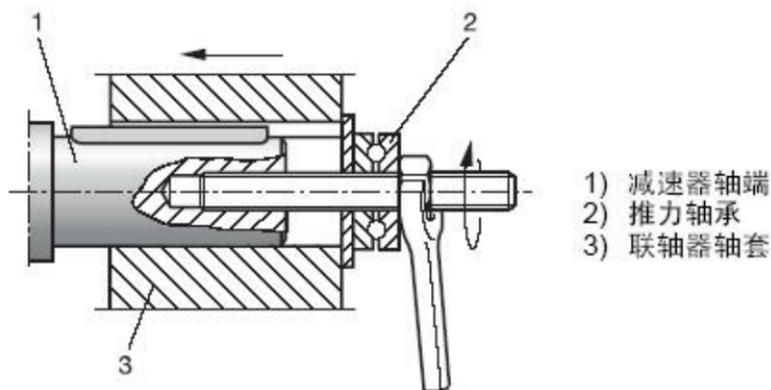
## 油漆减速器

如果要给传动装置覆盖一层油漆或者进行部分补漆，就必须注意将透气阀和轴密封环小心用胶条裹住。当结束喷涂漆层后，请剥去保护用胶条。

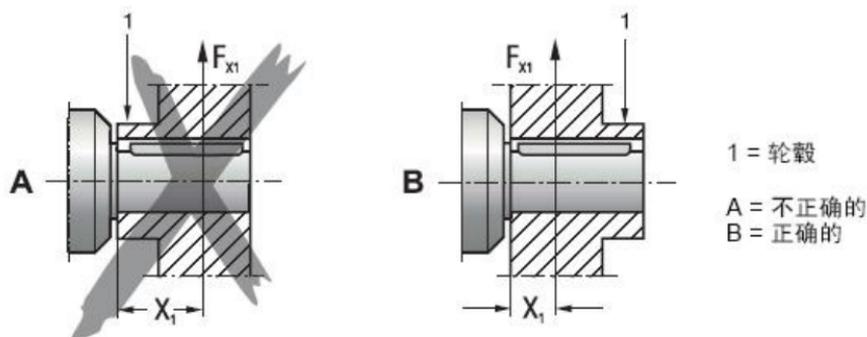
## 4.4 带有实心轴的减速器

### 传动轴与输出部件的装配

下图示意了采用套装夹具将联轴器或轮毂安装到减速器或电机的轴端上的操作。有可能要放弃套装夹具上的推力轴承。



为了避免不允许的径向力：请您按图 B 装配齿轮或者链轮。



· 请只用套装夹具装配输入和输出部件。请使用轴端部带有螺纹的对中孔进行装配。



· 皮带轮，联轴器，小齿轮等等绝对不能使用锤子敲击的方法套装到轴端部上。否则有可能损伤轴承，外壳以及轴！

· 安装皮带时请注意皮带的正确张力(根据制造商的规定)。

· 装配好的传动件应当平衡并且不允许出现径向或者轴向受力（允许值参见“减速电机”样本）。

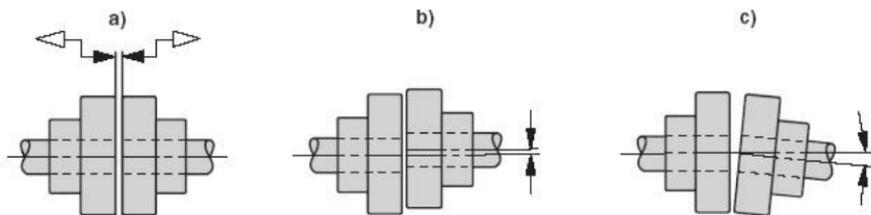
提示：

如果您事先使用润滑剂涂抹到输出部件上或者短时间加热（到80~100℃），就可轻松地进行装配。如果加热温度超过100℃，会有烫伤油封的风险，请采取必要的隔热措施以保护减速机油封。

## 联轴器的装配

在装配联轴器时，必须根据联轴器制造商的规定进行下列调整：

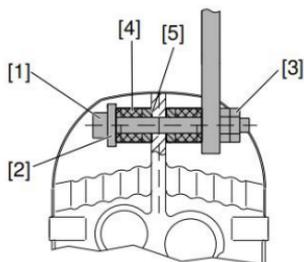
- a) 最大间距和最小间距
- b) 径向偏差
- c) 角偏差



## 4.5 轴装式减速器的扭矩臂

扭矩臂安装不当会损坏减速器，装配时请勿拉紧扭矩臂！

### 平行轴- 斜齿轮减速器



- [1] 螺栓
- [2] 垫圈
- [3] 螺母
- [4] 橡胶缓冲块
- [5] 橡胶缓冲块的金属侧

### 安装步骤

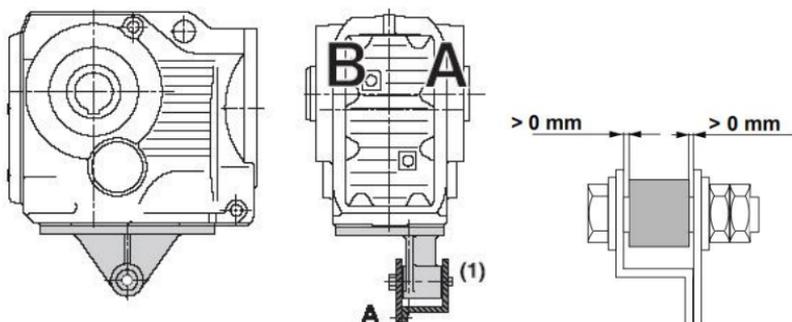
1. 请确保橡胶缓冲块的金属侧靠近减速机
2. 安装螺栓和垫圈
3. 拧紧螺栓，直至单个橡胶块的变形 $\Delta L$  满足如下要求。

F 减速机规格	$\Delta L / \text{mm}$
27~37	1
47~87	1.5
97~107	2
127~157	3

### 斜齿轮- 锥齿轮减速器

1. 以无应力方式安装轴套（1），安装前确保插座与轴套的间隙大于 0.

· 下表列出了螺栓规格和拧紧力矩：

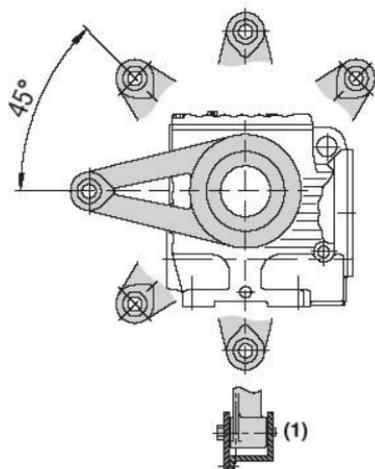


减速器	螺栓	拧紧扭矩
KA37	4 × M10 × 25 -8.8	48 Nm
KA47	4 × M10 × 30- 8.8	48 Nm
KA57	4 × M12 × 35- 8.8	86 Nm
KA67	4 × M12 × 35- 8.8	86 Nm
KA77	4 × M16 × 40 -8.8	210 Nm
KA87	4 × M16 × 45 - 8.8	210 Nm
KA97	4 × M20 × 50- 8.8	410 Nm
KA107	4 × M24 × 60 -8.8	710 Nm
KA127	4 × M36 × 130 - 8.8	2500 Nm
KA157	4 × M36 × 130 -8.8	2500 Nm

### 斜齿轮- 蜗轮蜗杆减速器

· 以无应力方式安装轴套.(1)

· 下表列出了螺栓规格和拧紧力矩：



减速器	螺栓	拧紧扭矩
SA37	M6 × 16- 8.8	11 Nm
SA47	M8 × 20 - 8.8	25 Nm
SA57	M8 × 20 -8.8	25 Nm
SA67	M12 × 25- 8.8	86 Nm
SA77	M12 × 35-8.8	86 Nm
SA87	M16 × 35 -8.8	210 Nm
SA97	M16 × 35- 8.8	210 Nm

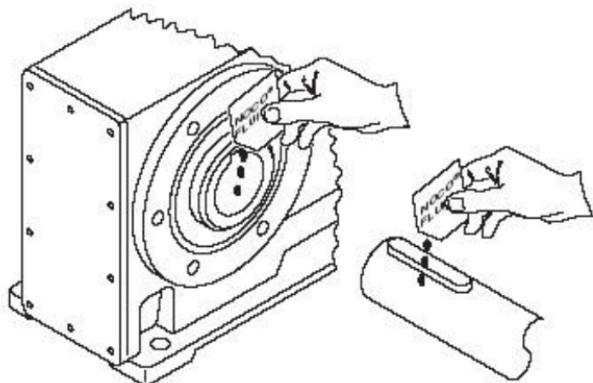
#### 4.6 带键槽或花键的空心轴减速器



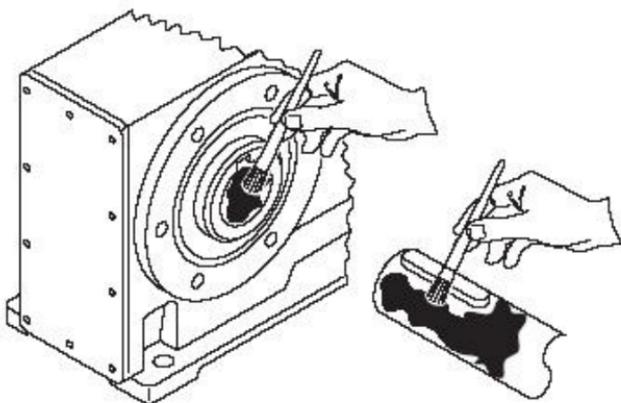
用户轴的配置请注意参看产品目录中的减速电机中的结构说明！

## 安装说明

### 1. 涂抹润滑脂



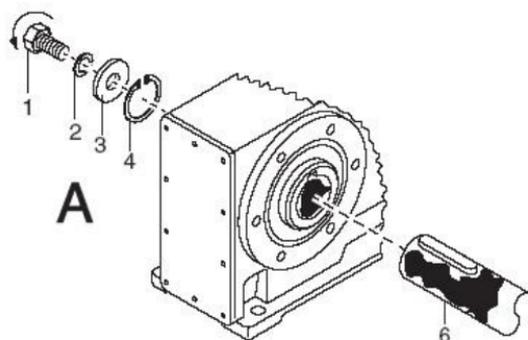
### 2. 小心地涂均润滑脂



### 3. 轴的装配与保护

(通过使用套装夹具将会使安装变得容易)

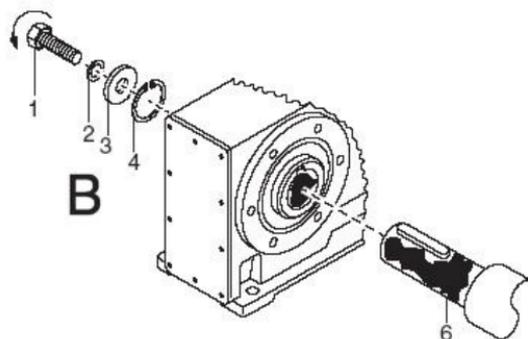
3A: 使用提供的所有部件进行安装



- 1 短固定螺钉 (标准供货配件)
- 2 弹簧垫圈
- 3 垫片
- 4 卡环
- 6 用户轴

3B: 采用 DONLY 拆卸套件进行安装

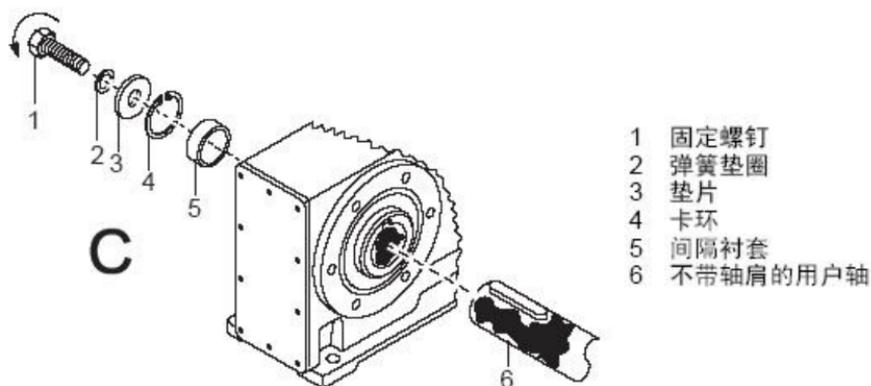
- 带有轴肩的用户轴



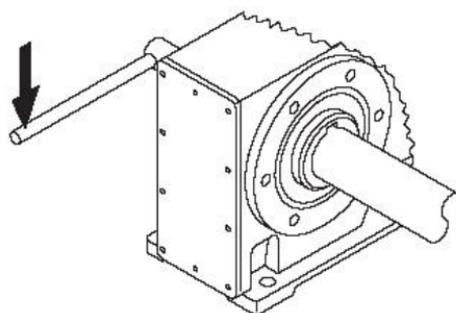
- 1 固定螺钉
- 2 弹簧垫圈
- 3 垫片
- 4 卡环
- 6 带轴肩的用户轴

3C: 采用 DONLY 拆卸套件进行安装

- 不带轴肩的用户轴



#### 4. 使用规定的扭矩拧紧固定螺钉（见表）



螺栓	施加扭矩 [Nm]
M5	5
M6	8
M10/12	20
M16	40
M20	80
M24	200



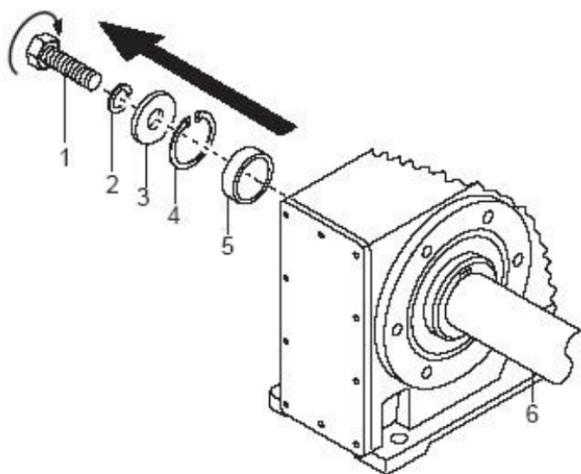
提示：

为避免磨擦带来的损伤，我们在此推荐应该使用户轴在两个支承面之间可以自由转动！

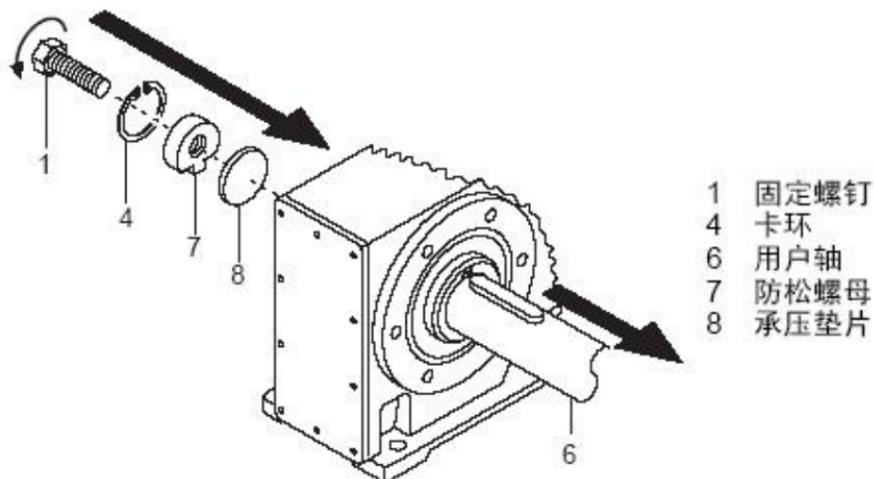
## 拆卸说明

该规范说明只适用于采用 DONLY 供的安装/ 拆卸工具组件进行的拆卸。

1. 请松开安装固定螺钉 1。
2. 拆下零件 2 至零件 4，如果有必要，连同拆去间隔衬套 5。
3. 请将安装与拆卸组件包中的承压垫片 8 以及防松螺母 7 安装在用户轴 6 与卡环 4 之间。
4. 安装卡环 4。
5. 旋紧固定螺钉 1，将减速器与传动轴脱开。

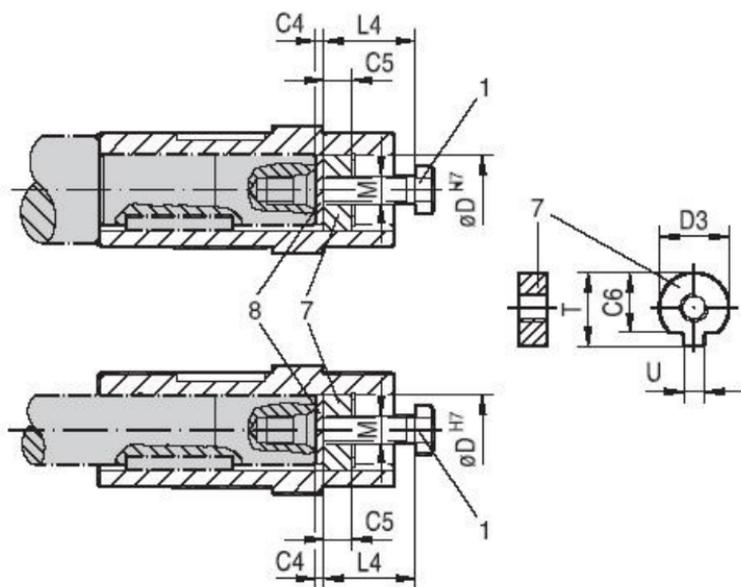


- 1 固定螺钉
- 2 弹簧垫圈
- 3 垫片
- 4 卡环
- 5 间隔衬套
- 6 用户轴



DONLY 拆卸工具组件

DONLY 拆卸工具组件包可以依据给出的零部件明细表进行预订。



1 固定螺钉

7 拆卸用防松螺母

8 承压垫片

M: 固定螺钉

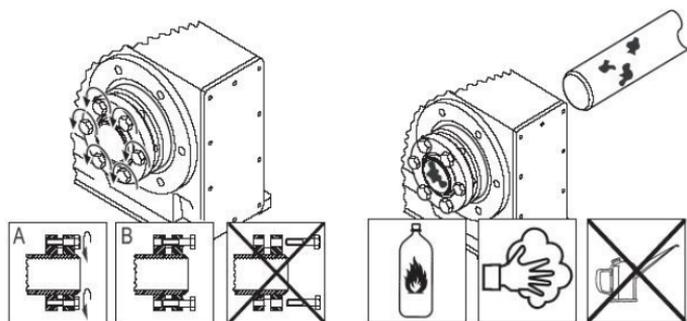
此处描述的用来紧固用户轴的 DONLY 安装组件包由 DONLY 提供。同时必须经常检查其设计结构能有效地对轴向载荷进行补偿平衡。特殊要求场合下（例如紧固搅拌旋转轴）则应配置一个额外的构件来确保轴向安全。这种情况下无论何时都可由用户自行配备一个轴向安全结构。但在这里要保证该结构根据 GB25286 标准不能引起潜在的电火源（例如放电火花）。

## 4.7 带锁紧盘的轴装式减速器

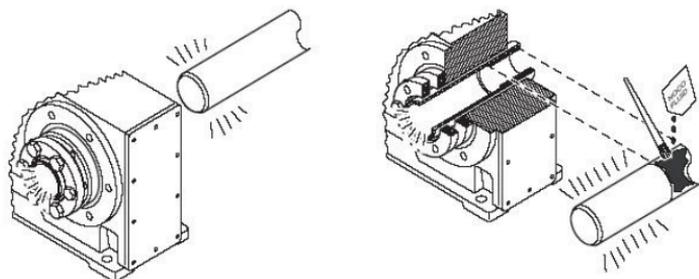
### 安装说明

注意，不得在未安装实心轴的情况下拧紧锁紧螺栓，这会损坏空心轴！

1. 将锁紧螺栓松开几扣（不要全部松出！）。
2. 除去空心轴通孔以及传动轴上的油污。



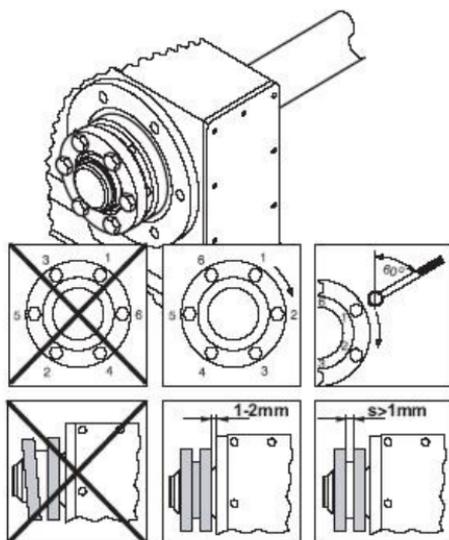
3. 在传动轴上涂上抗咬合剂（起到润滑、防锈、防蚀作用）。



注意，锁紧盘的夹紧区域不得有任何的油污！因而不允许将抗咬合剂直接涂覆在空心轴里，在该情况下通过传动轴的装入操作可以使锁紧盘的夹紧区域沾染油污。

4. 装配主机传动轴，在这个过程中要注意锁紧盘平面平行的外环。对于带轴肩的减速器箱体在轴肩的凸起部位安装轴环锁紧缩盘。对于不带轴肩的减速器箱体将锁紧盘距离减速器箱体 2~3mm 进行安装。采用

扭力扳手将锁紧螺栓连续旋入多圈（不要超过上面的十字记号），直到锁紧螺栓再也不能旋入为止。锁紧时采用的扭矩见下表。



5. 在安装过程结束后，检查锁紧盘外环之间必须保留有  $s > 0 \text{ mm}$  的间隙
6. 为避免腐蚀，在锁紧盘的安装区域内空心轴的外表面应涂上润滑剂。

减速器型号	螺栓	拧紧扭矩 $\pm 4\%$ Nm
FH27、SH37	M5	5
KH37~77、FH37~77、SH47~77	M6	12
KH87/97、FH87/97、SH87/97	M8	30
KH107、FH107	M10	59
KH127/157、FH127/157	M12	100
KH167	M16	250
KH187	M20	470

## 锁紧盘拆卸过程说明

1. 平稳有规律地松动锁紧螺栓。为避免外环的变形损伤，每个锁紧螺栓先旋转松开四分之一圈。然后依次均匀松开所有锁紧螺栓，注意不要全部旋出！
2. 拆卸轴，即将轮毂从轴上取下（轴上轮毂处可能形成的铁锈层必须事先去除掉）。
3. 将锁紧盘从轮毂上取下。



**注意！**

**不正确的锁紧盘拆卸操作有造成人身伤害的危险！**

## 对锁紧盘进行清洁以及润滑处理

在重新安装前，拆卸下来的锁紧盘不需要进一步的拆分及涂覆润滑油。仅仅当锁紧盘变脏时，才需要作清洁处理并涂覆上润滑油。

对于锥平面的润滑需要采用固态的润滑油脂。

润滑剂 (Mo S2)	商业包装形式
二硫化钼润滑剂 321 ( 润滑漆膜 )	喷洒方式
二硫化钼喷雾罐 ( 粉末喷雾 )	喷洒方式
二硫化钼 G Rapid	喷雾或者膏体
Aemasol MO 19P	喷雾或者膏体
Aemasol DIO-sétral 57 N ( 润滑漆膜 )	喷洒方式

锁紧螺栓可以采用通用润滑脂进行润滑。

## 4.8 安装膨胀油箱

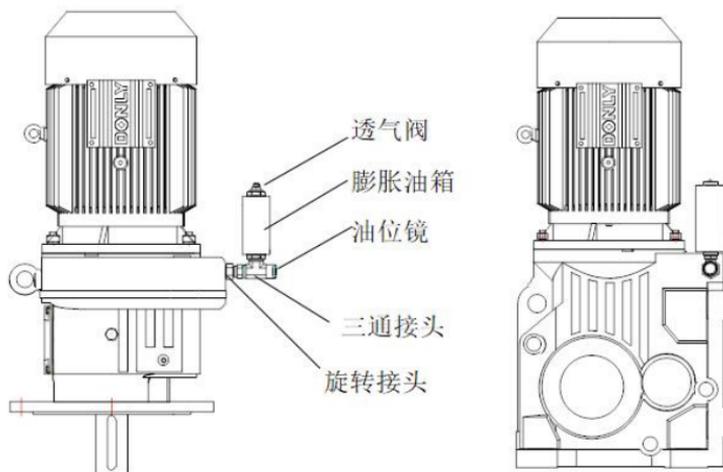
对于规格 107 及以上的减速机位于安装位置 M4 时，在不利情况下，技术要求的液位可能导致润滑油通过透气阀溢出。为可靠的防止漏油，请安装膨胀油箱。



注意，膨胀油箱不是默认选项，仅作为配套件供货，若有需要请在订货要求中指出。

请按照下图所示安装膨胀油箱。安装步骤如下：

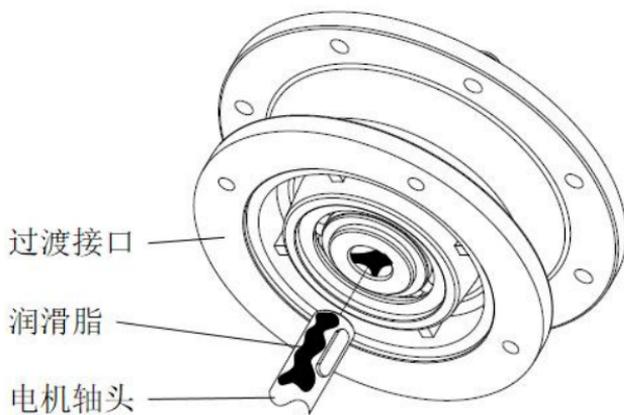
1. 将旋转接头装入箱体的油位螺塞孔中，并拧紧固定。
2. 将三通接头调整至竖直状态，与旋转接头对接并拧紧固定。
3. 将膨胀油箱与三通接头对接，并拧紧固定。
4. 安装并拧紧透气阀和油位镜



## 4.9 为 AM、SF 过渡接口安装电机

通过过渡接口，DONLY 减速机可与 IEC 标准电机和伺服电机相连接。东力过渡接口设置为直接键连接，电机安装步骤如下：

1. 在电机轴头和接口内孔处涂适量润滑脂，并均匀涂布，可起到防锈和降低装配阻力的作用。
2. 对于应用于潮湿环境的减速机，应在法兰接合面上涂抹密封胶（乐泰 207），防止接合面及内部零件锈蚀。
3. 将电机轴头对准过渡接口内孔，电机键对准过渡接口内孔的键槽，平稳对接推入。
4. 装入并拧紧螺栓。
5. 在装配过程中，禁止用锤子敲击减速机或电机，以免造成损坏。



## 5 调试

注意，不当调试可能导致减速器损坏。

试运转前检查油位高度是否与减速器的安装方式相适应。

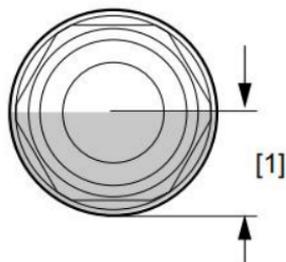
操作人员必须能方便地操作油量控制螺栓、放油螺塞以及透气阀。

检查所有紧固螺栓是否牢固。拧紧紧固件后确保定位没有发生变化。

调试前卸下运输固定装置以激活透气阀。

### 5.1 检查油位

按照下图在油镜上检查油位。油位必须在[1]标识范围内。



### 5.2 调试斜齿轮- 蜗轮蜗杆减速器

#### 磨合时间

斜齿轮-蜗轮蜗杆减速器需要最少 48 小时的磨合时间才能达到最高工作效率。将减速器按两个转动方向进行试运转时，每个转动方向的试运转各适用一个独立的磨合时间。

### 5.3 调试斜齿轮减速器、平行轴-斜齿轮以及斜齿轮-锥齿轮减速器

对于斜齿轮减速器，平行轴-斜齿轮减速器以及斜齿轮-锥齿轮减速器，当采用“机械安装”一章的说明进行安装时，对它们的试运转没有特殊的提示要求。

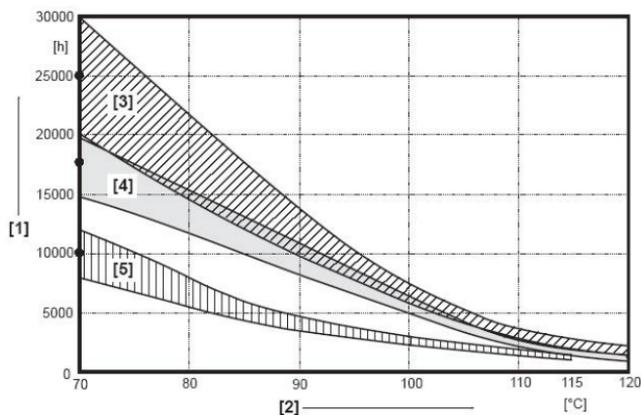
# 6 检查与维护

## 6.1 检查与维护周期

时间间隔	应做些什么？
. 日常工作	<ul style="list-style-type: none"><li>. 检查箱体温度<ul style="list-style-type: none"><li>. 对于矿物机油：最大 90°C</li><li>. 对于合成机油：最大 100°C</li></ul></li><li>. 检查减速器噪声</li><li>. 检查减速器是否有泄漏现象</li></ul>
. 在机器运行 500~800 小时后	<ul style="list-style-type: none"><li>. 首次投入运行后的第一次机油更换</li></ul>
. 每 3000 机器小时，最低程度半年。	<ul style="list-style-type: none"><li>. 检查油的质量以及油位。</li><li>. 油封、油堵、油镜密封不严引起滴漏的常规检测。</li><li>. 带扭矩臂的减速器：检测橡胶缓冲块，必要时进行更换。</li></ul>
使用矿物油时： . 根据不同的工作条件（见下图）而定，最长每三年检测一次。 . 根据油温决定。	<ul style="list-style-type: none"><li>. 更换矿物油。</li><li>. 更换轴承润滑油脂（推荐）。</li><li>. 更换油封（不要安装在原来的接触轨迹上）。</li></ul>
使用合成油时： . 根据不同的工作条件（见下图），最长每五年检测一次。 . 根据油温决定。	<ul style="list-style-type: none"><li>. 更换合成油。</li><li>. 更换轴承润滑油脂（推荐）。</li><li>. 更换油封（不要安装在原来的接触轨迹上）。</li></ul>
. 视具体情况而定（取决于外部影响因素）。	<ul style="list-style-type: none"><li>. 改善或者更换表面防护漆/防锈漆。</li><li>. 检查锁紧盘的锁紧效果。</li></ul>

. R17, R27, F27 减速器为免维护设计，故不需要更换润滑油。

## 6.2 润滑剂更换时间间隔



适用于正常环境条件下标准减速器的更换时间间隔

[1] 工作小时数

[2] 油池持续温度

[3] CLP PG (聚乙二醇)

[4] CLP HC (合成碳氢化合物, PAO)

[5] CLP (矿物油)

## 6.3 减速器检查/ 维护作业

人工合成润滑剂之间以及人工合成润滑剂与天然矿物润滑剂不得混合使用!

标准情况下应使用矿物机油作为润滑剂。



必须从安装方式示意图中获取相关安装方式的油位螺塞和放油螺塞以及透气阀的位置。

检查油位

1. 切断减速电机的电源, 确保不会被意外接通!

等待减速器冷却下来. 有烫伤的危险!

2. 在改变安装方式时，请注意“机械安装”章节中的内容！
3. 如果是配有油位螺塞的减速器：去掉油位螺塞，检查加油高度，必要时修正加油高度，旋入油位螺塞。

## 检查机油



1. 切断减速电机的电源，确保不会被意外接通！ 等待减速器冷却下来，有烫伤的危险！
2. 从放油螺塞上去除一些机油。
3. 检查机油状态。
  - 粘度

- 如果机油看起来很脏，建议在“检查与维护周期”章节中规定的维护间隔时间之外更换机油。

2. 如果是配有油位螺塞的减速器：去掉油位螺塞，检查加油高度，必要时修正加油高度，旋入油位螺塞。

## 更换机油



仅当减速器尚有工作余温时更换机油。

**切断减速电机的电源，确保不会被意外接通！**

**等待减速器冷却下来，有烫伤的危险！**

**提示：减速器必须仍然有余温，因为冷机油的流动性差，影响正确排放。**

带有放油螺塞以及油位螺塞

1. 将承接容器放在放油螺塞下方。
  2. 去掉油位螺塞，排气螺栓/阀和放油螺塞。
  3. 将机油完全放空。
  4. 旋入放油螺塞。
  5. 通过排气孔加入同类型的新机油(否则请与 DONLY 客户服务部联系)。不允许混合使用不同的人工合成油。
- 加油量根据安装方式或者根据铭牌上的规定。

- 在油位螺塞上进行检查。
- 6. 旋入油位螺塞。
- 7. 旋入排气螺栓/ 阀。

不带放油螺塞以及油位螺塞

1. 拆下视孔窗。
2. 油通过视孔窗完全排放尽。
3. 通过排气孔加入同类型的新机油(否则请与 DONLY 客户服务部联系)。不允许混合使用不同的人工合成油。
  - 加油量根据安装方式或者根据铭牌上的规定。
4. 检测油位
5. 再次安装固定试孔窗

### 更换油封



**1. 切断减速电机的电源，确保不会被意外接通！  
等待减速器冷却下来，有烫伤的危险！**

2. 在更换油封时要注意，视技术要求参数而定在脏污边界和密封口边沿之间必须有足够的油量。

3. 当采用双重油封密封时，在两个油封之间所围成的空间内必须注入占该空间约三分之一的润滑脂。

## 7 运转故障

如果您需要我们的客户服务部进行帮助，我们需要下列数据：

- 铭牌上的数据（完整）
- 故障的类型和程度
- 故障发生时间和伴生现象
- 估计原因

### 7.1 减速器故障

故障	可能的原因	解决办法
异常、均匀的运转噪声。	A. 滚动 / 碾压噪声：轴承损坏。 B. 冲击型噪声：齿轮啮合不均匀	A. 检测润滑油（参见“检查与维护作业”），更换轴承。 B. 请向客户服务部咨询。
异常、不均匀的运转噪声。	机油中有异物。	• 检测润滑油（参见“检查与维护作业”）。 • 停止运转传动装置，向客户服务部咨询。
机油泄漏 <sup>1)</sup> <ul style="list-style-type: none"><li>• 在减速器盖盖上</li><li>• 在电机凸缘上</li><li>• 在电机轴密封圈上</li><li>• 在减速器凸缘上</li><li>• 在输出端轴密封圈上。</li></ul>	A. 减速器底座上的橡胶密封发生渗漏。 B. 密封圈损坏。 C. 减速器没有排气。	A. 拧紧各个外盖上的螺钉并且观察减速器。如果机油继续泄漏，请向客户服务部咨询。 B. 请向客户服务部咨询。 C. 给减速器排气（参见“安装方式”章节）。
机油从排气阀旁渗出。	A. 机油太多。 B. 传动装置安装方式错误。 C. 频繁冷启动（机油起泡沫）和 / 或者较高的油位。	A. 修正油量（参见“检查与维护作业”）。 B. 正确安装排气阀（参见“安装方式”章节）并且矫正油位（参见“润滑油”章节）。
尽管电机在运转或者传动轴已经被驱动，但是传动轴不转动。	减速器中的轴轮联轴器断裂。	将减速器或减速电机送修。

1) 在磨合运转阶段（24 小时的运转时间内），轴密封圈有可能出现短期内的漏油 / 油胀的现象。

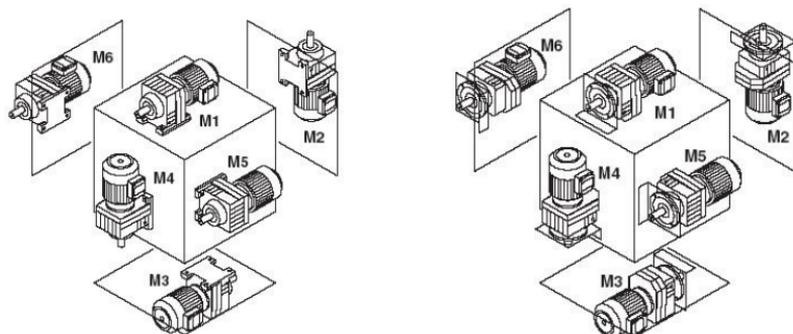
## 8 安装方式

### 8.1 关于安装方式的一般说明

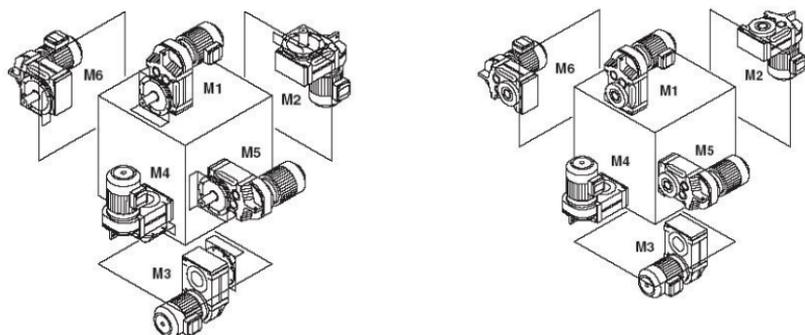
#### 安装方式示意图

DONLY 公司将减速器分类为六种不同的安装方式 M1 ~ M6。以下各图描述了安装方式 M1 ~ M6 中减速电机的安装位置。

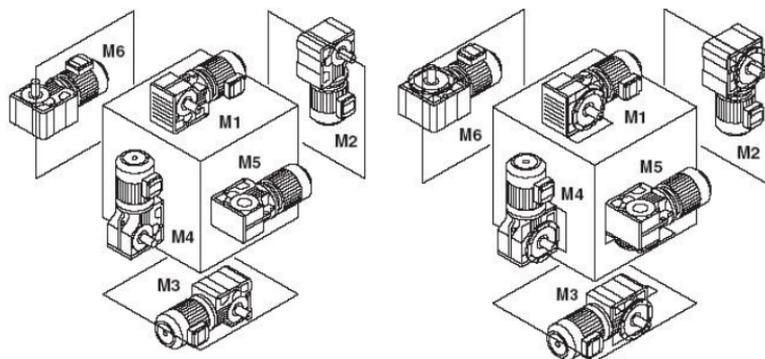
R..



F..



K../S..



## 8.2 关于安装方式图的注意事项

### 采用的图例

下列表格显示的是安装方式页面中使用的图例及其含义：

图例	含义
	排气阀
	油位调节螺栓
	放油螺栓



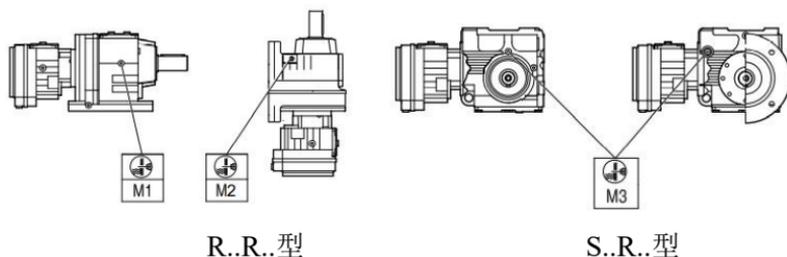
当图中安装位置带“\*”标记时，减速器第一级浸入润滑油中，当输入转速较高时，可能会出现搅油损失增加，需根据实际情况校核热功率。必要时请咨询 DONLY 公司。

### 双联减速器上的油位

双联减速器一般具有极慢的输出转速，内部润滑油溅射不充分。为保证双联减速器能够得到充分润滑，指定安装位置上的下列减速器需提高油位。

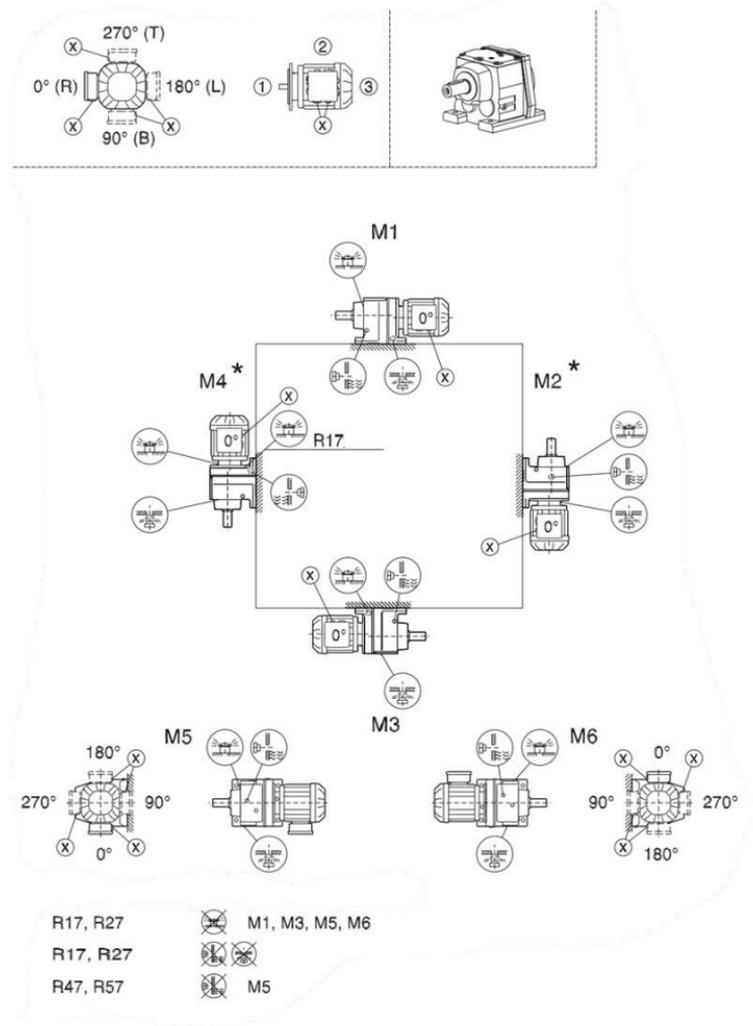
- 安装方式 M1 或 M2 的 R..R 型双联斜齿轮减速器
- 安装方式 M3 的 S..R..型双联斜齿轮-蜗轮蜗杆减速器

上述双联减速器的油位位于一下位置，与后文安装方式图中的规定不同。

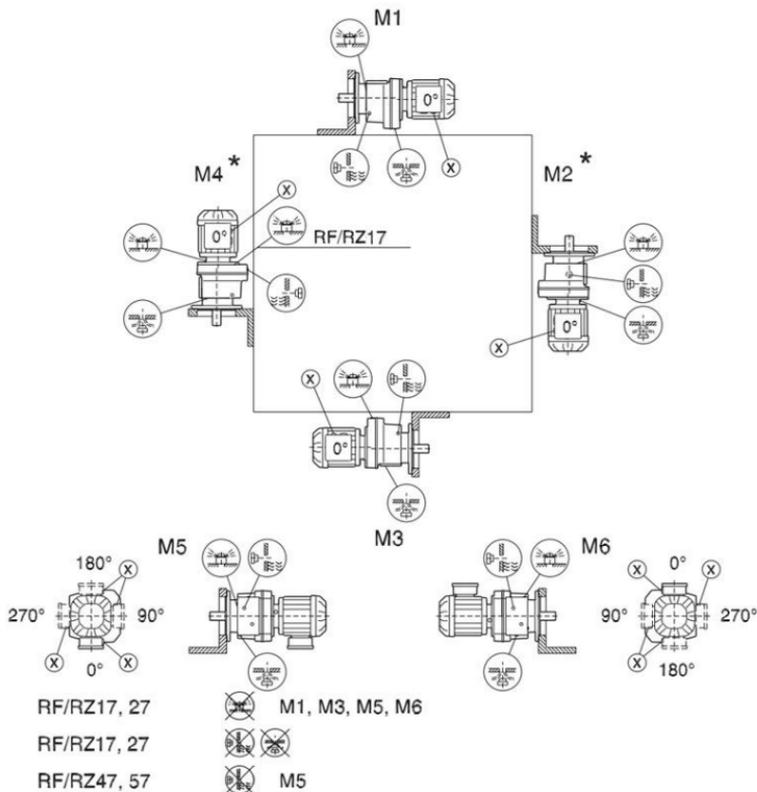
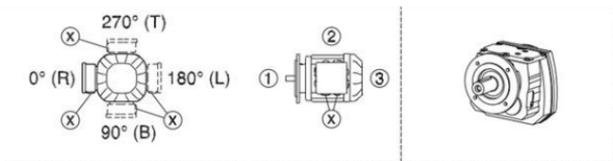


### 8.3 R 系列 斜齿轮减速电机的安装方式

R17~167, R17F~R87F

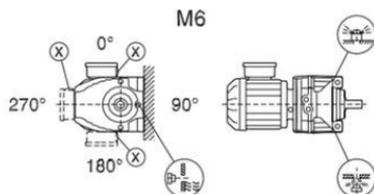
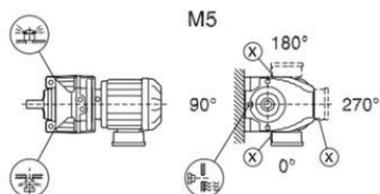
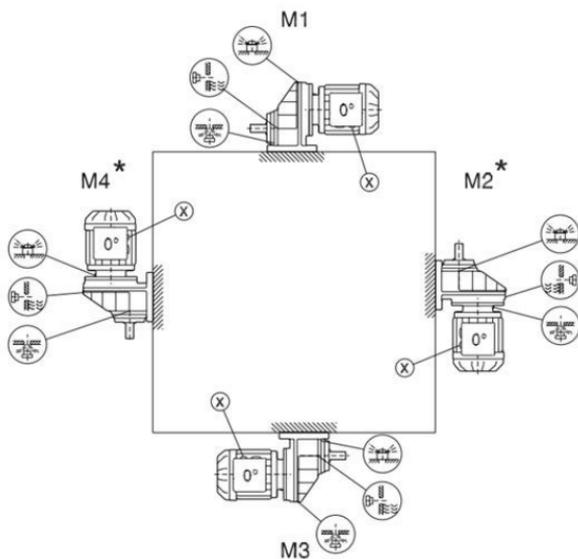
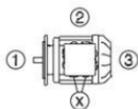
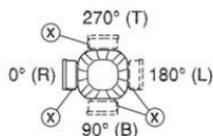


RF17~167, RZ17~87, RM57~167

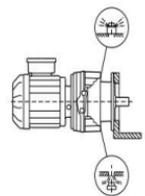
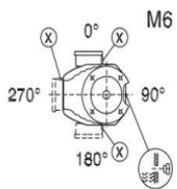
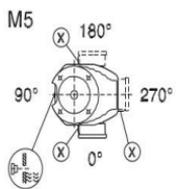
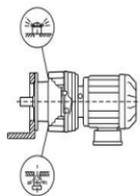
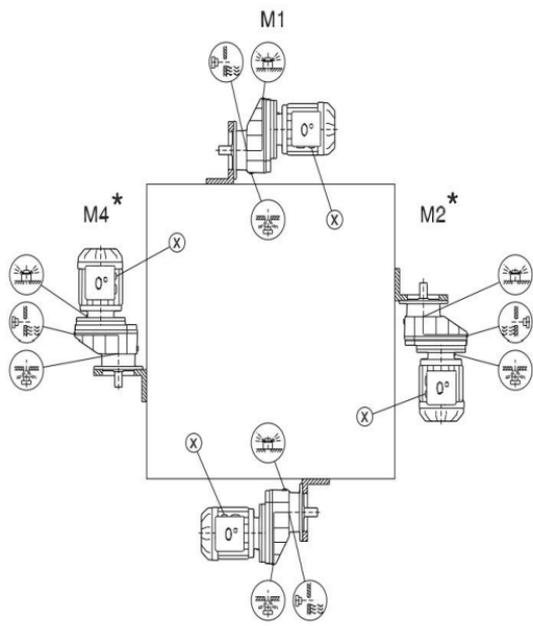
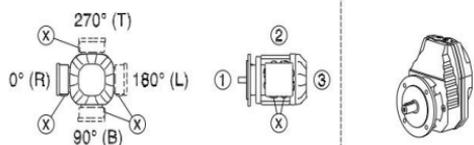


## 8.4 RX 系列斜齿轮减速电机的安装方式

RX57~107

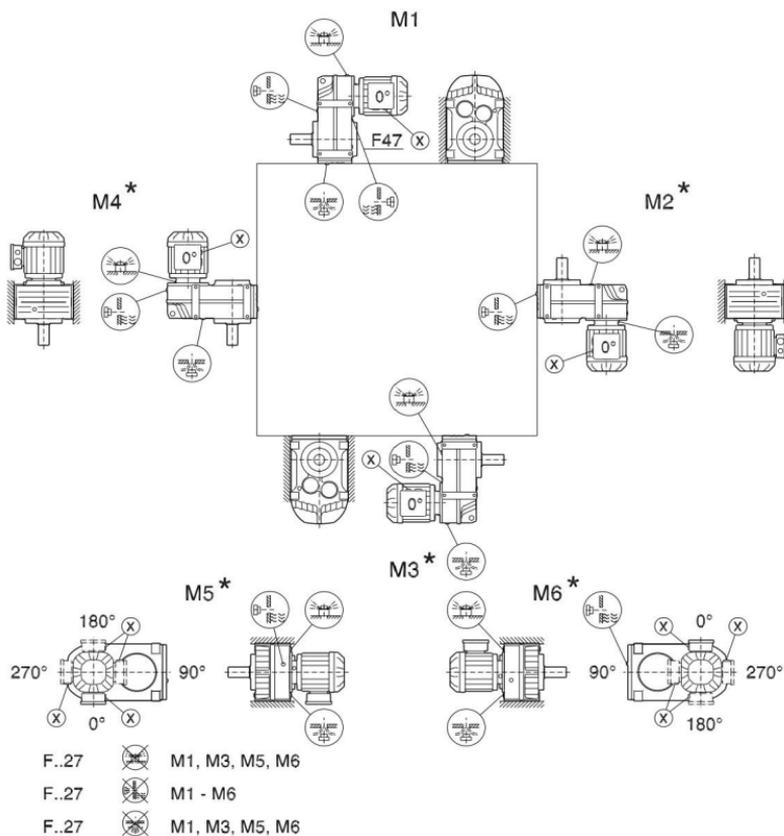
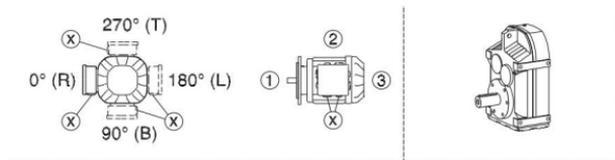


# RXF57~107

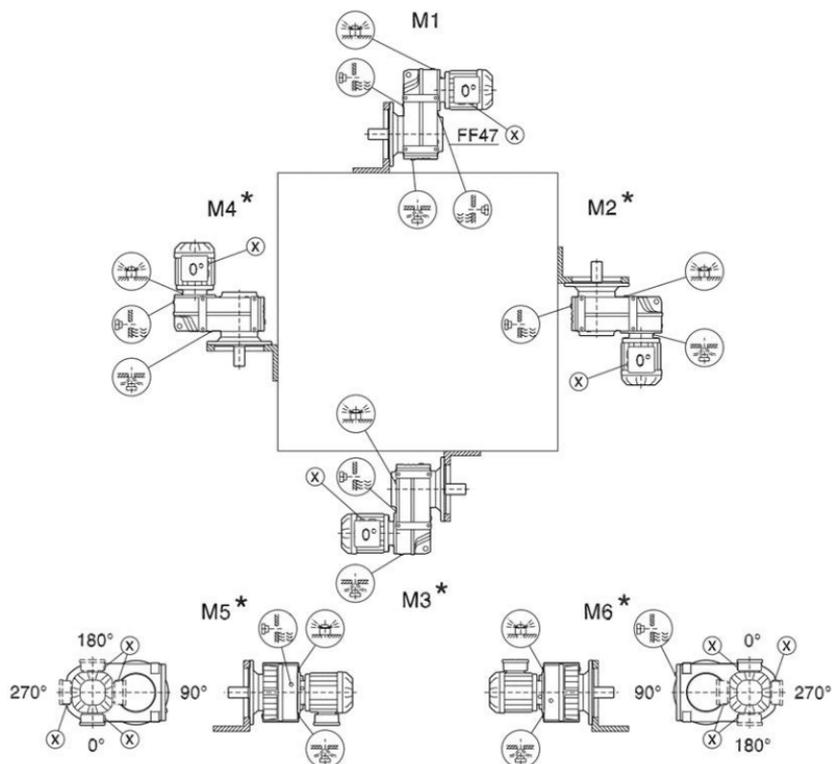
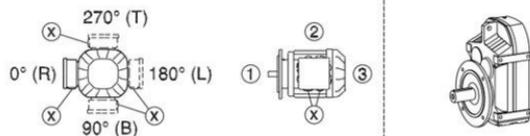


## 8.5 F 系列平行轴-斜齿轮减速电机的安装方式

F/FAB/FHB27~157, FVB27~107



FF/FAF/FHF/FZ/FAZ/FHZ27~157, FVF/FVZ27~107

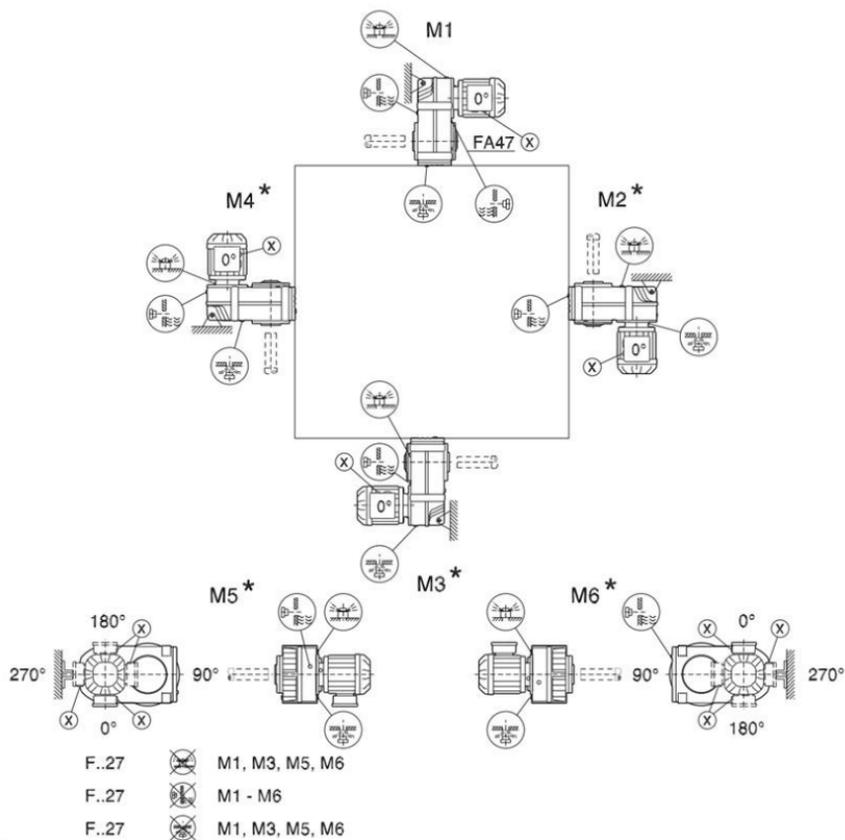
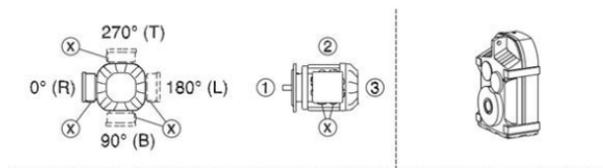


F..27 M1, M3, M5, M6

F..27 M1 - M6

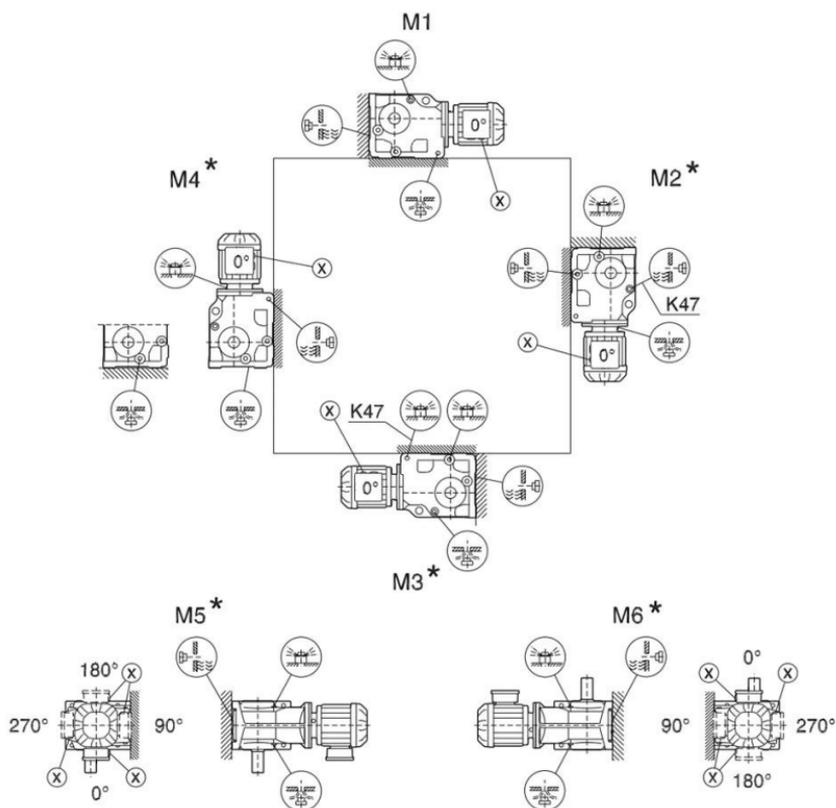
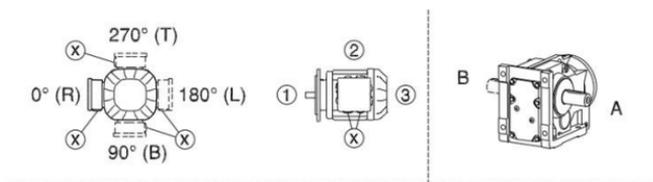
F..27 M1, M3, M5, M6

# FA/FH27~157, FV27~107

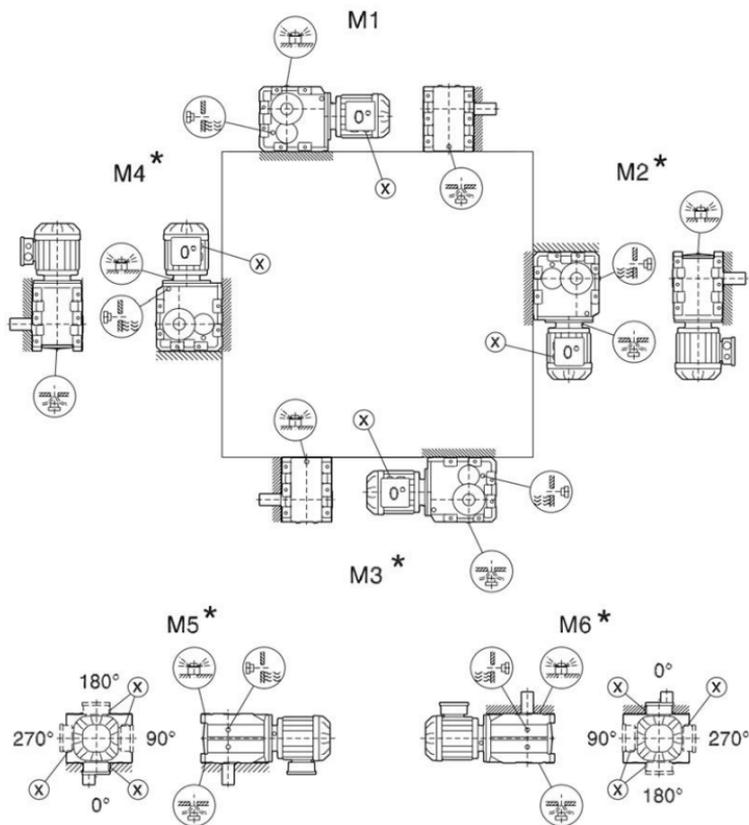
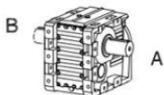
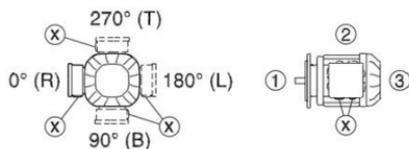


## 8.6 K 系列斜齿轮--锥齿轮减速电机的安装方式

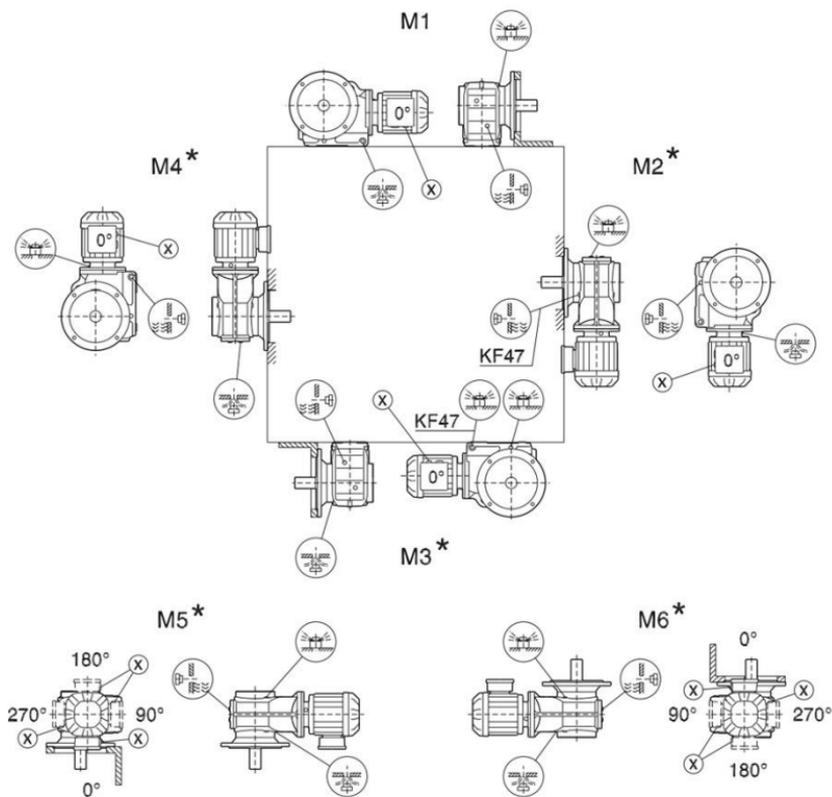
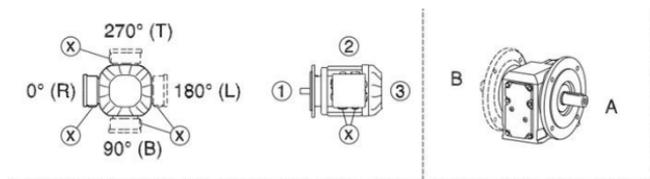
K37~157, KAB/KHB47~157, KVB47~107



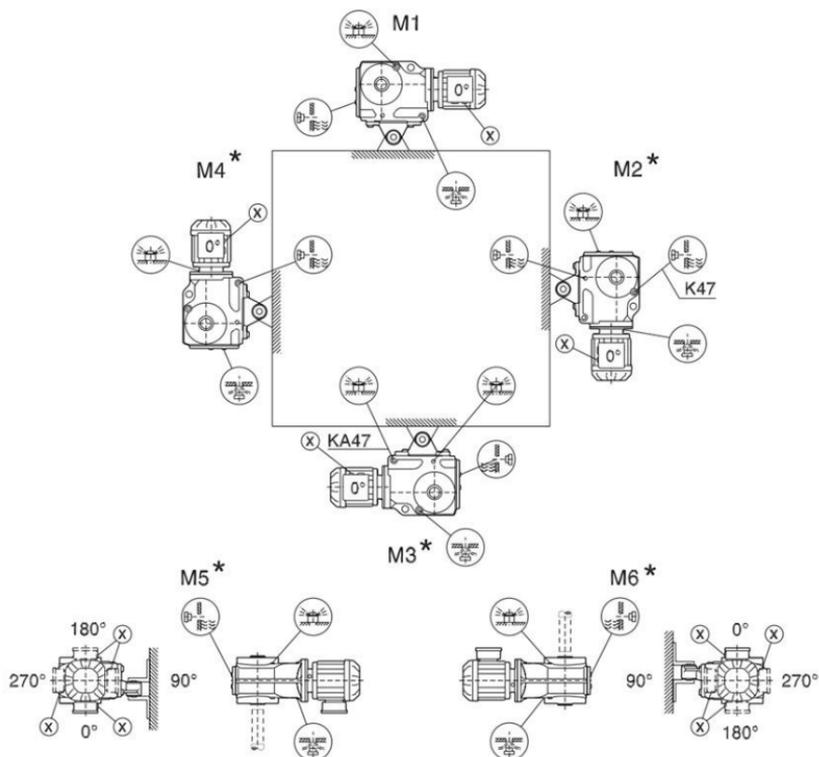
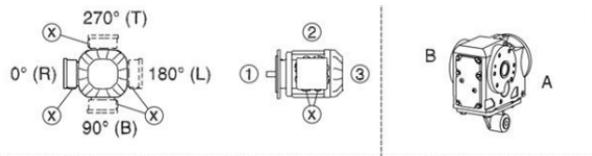
K167~187, KHB167~187



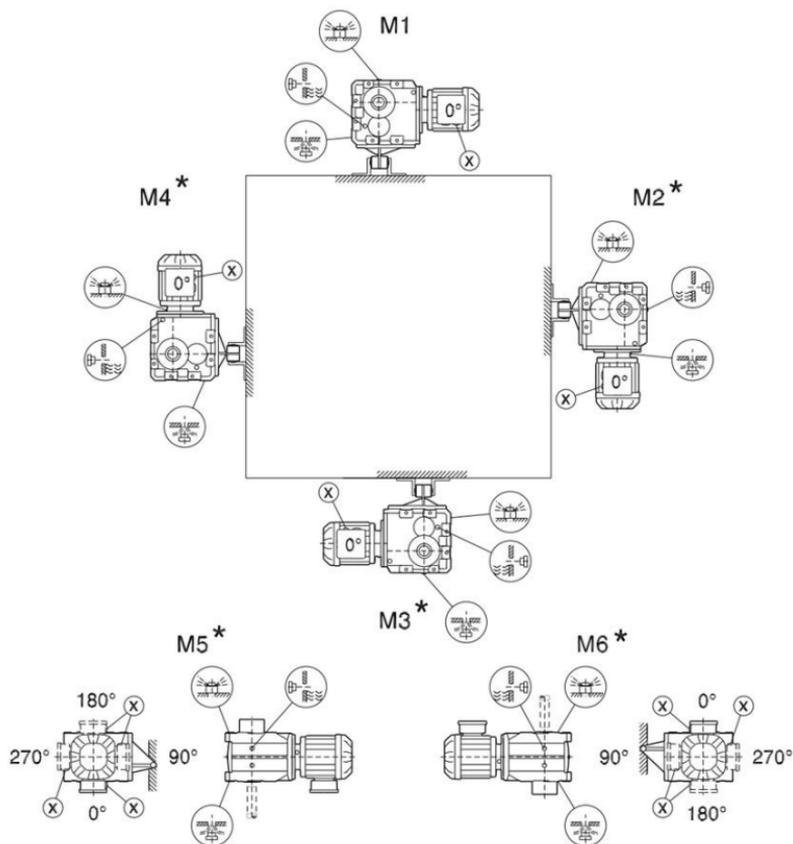
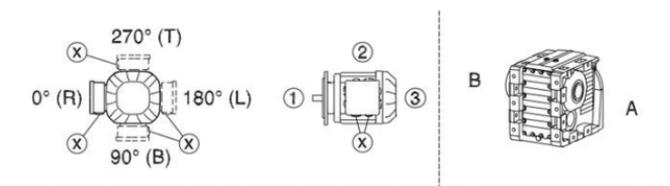
KF/KAF/KHF/KZ/KAZ/KHZ37~157, KVF/KVZ37~107



# KAT/KHT37~157, KVT37~107

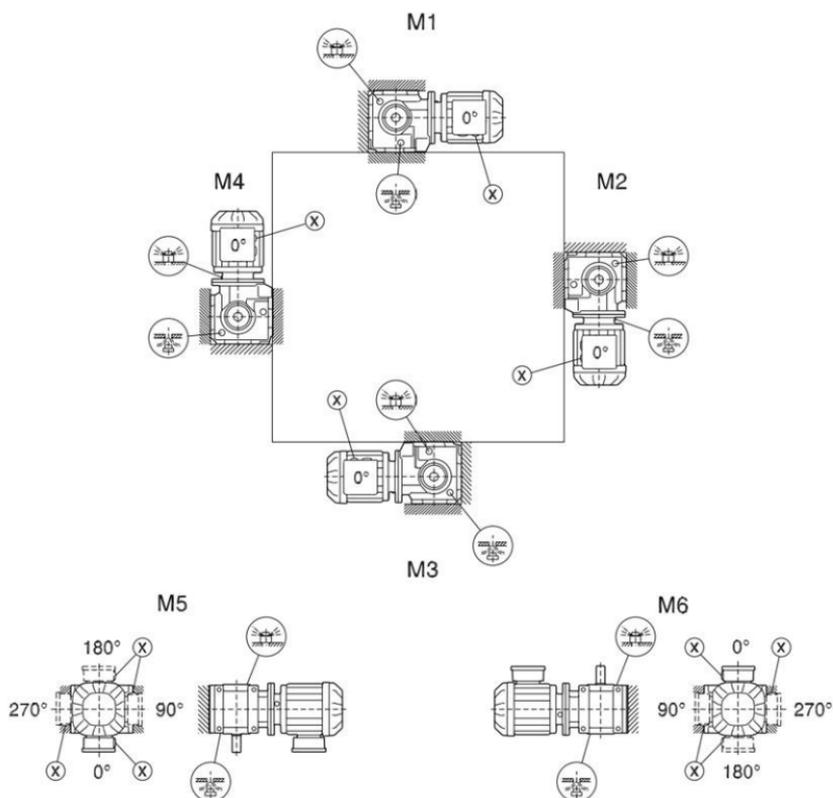
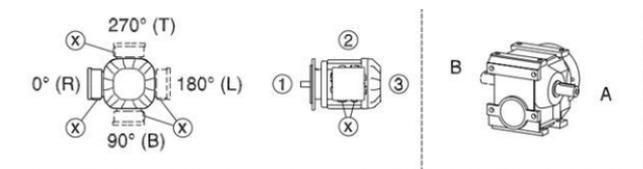


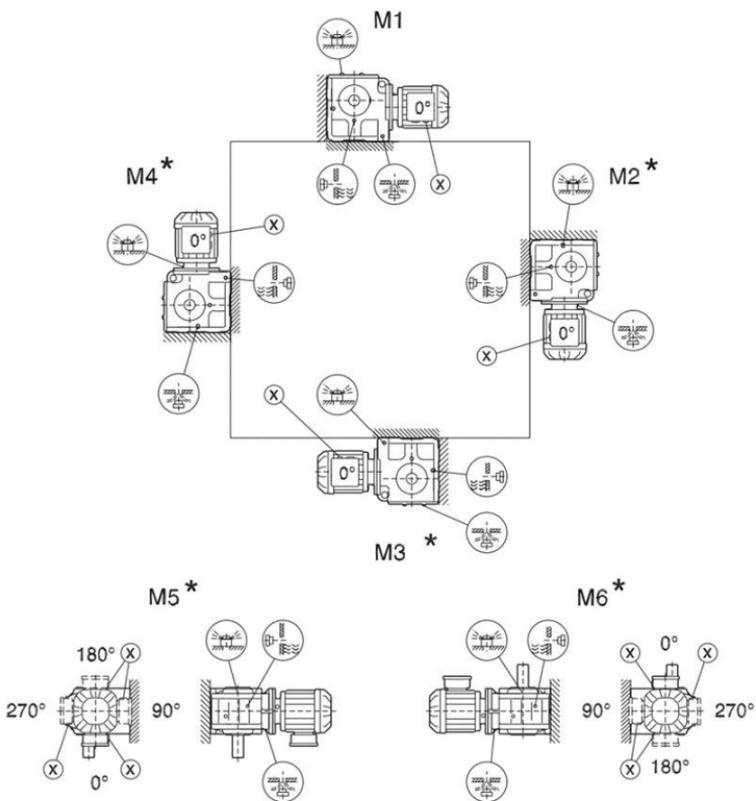
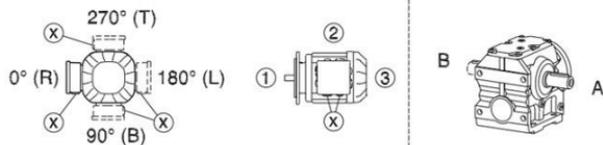
# KH167~187



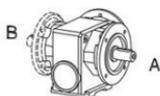
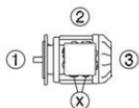
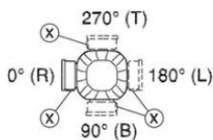
## 8.7 S 系列斜齿轮-蜗轮蜗杆减速电机的安装方式

S37

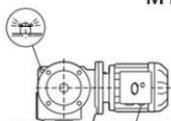




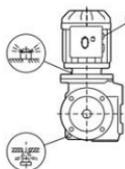
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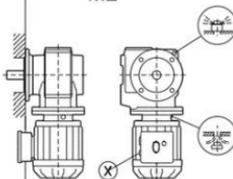
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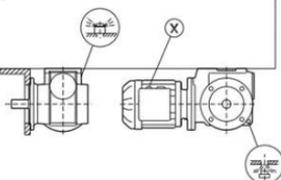
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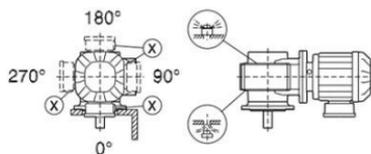
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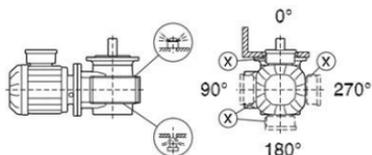
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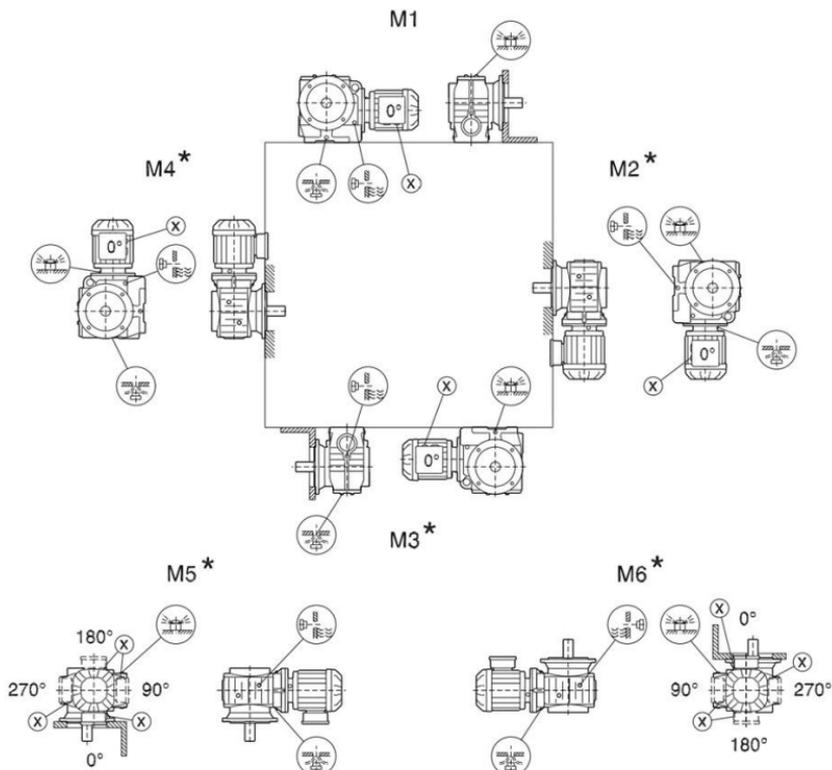
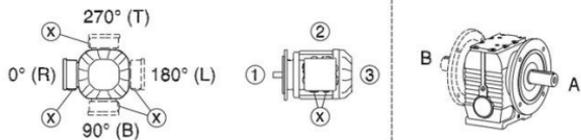
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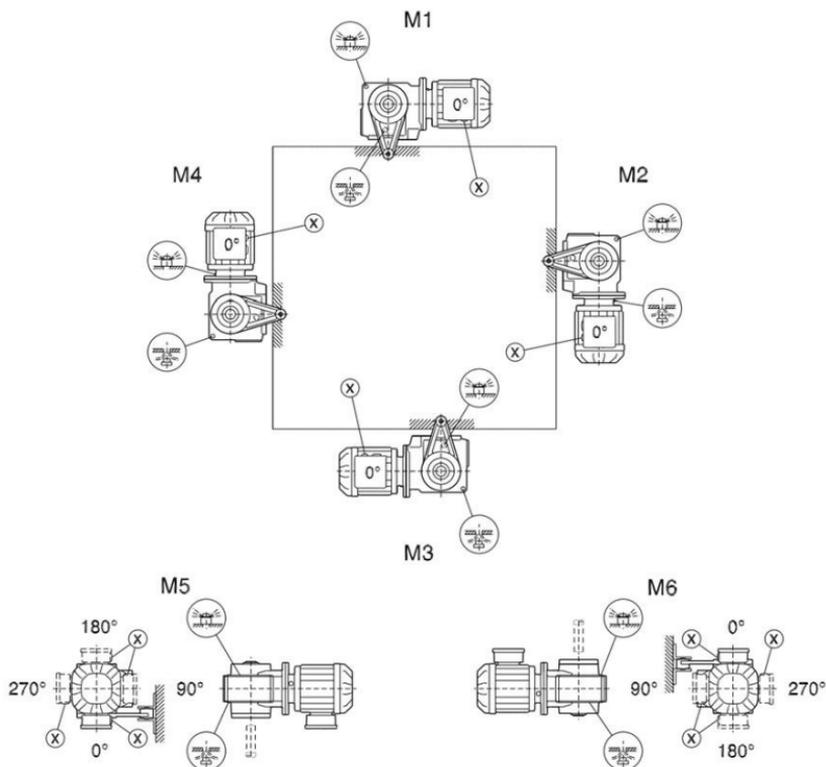
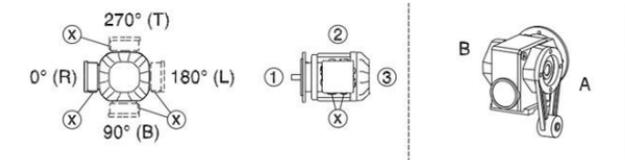
M6



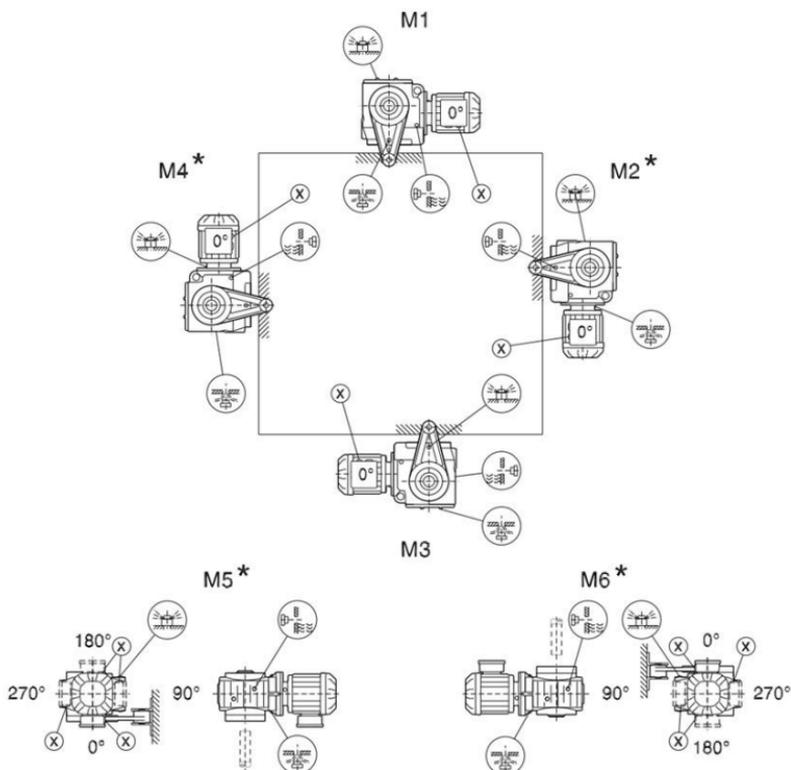
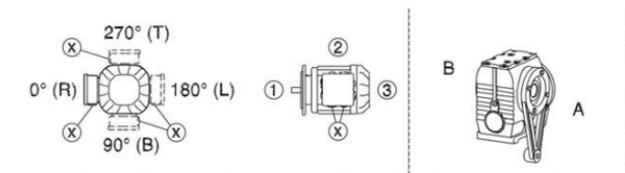
SF/SAF/SHF/SAZ/SHZ47~97



# SAT/SHT37



# SAT/SHT47~97



## 9 润滑剂

除非特殊说明，减速电机出厂时通常不带润滑油。客户在使用前确保按说明书加好润滑油。DONLY 公司将仅为您提供适用于订货所需安装方式的减速器。因为这个原因，所以请您在订货时指定与安装方式相关的参数 (M1~ M6, 详见产品样本)。在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量。

### 9.1 滚动轴承润滑脂

减速器和电动机的滚动轴承在出厂时就加注了下列润滑脂。对于配有润滑剂加注装置的滚动轴承，DONLY 公司建议在更换机油时也更换润滑脂。

环境温度	润滑脂品牌	型号
-40°C~60°C	长城	7036 (460)
-40°C~80°C	Mobil	XHP 222

列润滑脂加注量需满足如下要求：

- 如果是快速运转的轴承（电动机和减速器输入端）：轴承腔中加入三分之一的润滑脂。
- 如果是慢速运转的轴承（减速器中和减速器输出端）：轴承腔中加入三分之二的润滑脂。

### 9.2 齿轮润滑油

下面给出的润滑剂表中列出了适用于 DONLY 公司生产的减速器的润滑剂。

#### 关于润滑剂表的说明

缩略符号，阴影的含义和说明：

CLP = 矿物油

CLP PG = 聚乙二醇

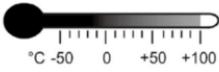
CLP HC = 合成碳氢化合物 (PAO)

HCE = 用于食品工业的润滑剂 (与食品相容)

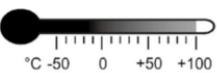
E = 酯化油 (用于农业、森林和水产经济的润滑剂)

## 润滑剂表

适用于 R、F、K 系列的润滑剂，见下表。

			ISO, NLGI						
-15	+40	CLP(CC)	VG 220	Mobilgear 600 XP 200	Shell Omala SG 220	Klüberoil GEM 1-220 N	Cater EP 220	BP Energol GR-XP 220	L-CKC220
-20	+30		VG 150	Mobilgear 600 XP 150	Shell Omala SG 150	Klüberoil GEM 1-150 N	Cater EP 150	BP Energol GR-XP 150	L-CKC150
-25	+80	CLP PG	VG 220	Mobil Glycoyle 220	Shell Omala S4 WE 220	Klüberoil GH 6-220	Cater SY 220	BP Energol SG-XP 220	
-25	+60	CLP HC	VG 220	Mobil SHC 630	Shell Omala S4 GX 220	Klüberoil GEM 4-220 N	Cater SH 220		L-CKT220
-30	+50		VG 150	Mobil SHC 629	Shell Omala S4 GX 150	Klüberoil GEM 4-150 N	Cater SH 150		L-CKT150
-35	+20		VG 68	Mobil SHC 626	Shell Omala S4 GX 68				
-40	0		VG 32	Mobil SHC 624			Dacnis SH 32		
-15	+40	HCE	VG 460		Shell Casskita Fluid GL460	Klüberoil 4UH1-460 N			
-20	+40	E	VG 320			Klüberoil EG2-320			

适用于 S 系列的润滑剂，见下表。

			ISO, NLGI						SINOPEC
0	+40	CLP(CC)	VG 680	Mobilgear 600 XP 680	Shell Omala SG680	Klüberoil GEM 1-680N	Cater EP 680	BP Energol GR-XP 680	L-CKC680
-10	+40		VG460	Mobilgear 600 XP 460	Shell Omala SG460	Klüberoil GEM 1-460N	Cater EP 460	BP Energol GR-XP 460	L-CKC460
-20	+80	CLP PG	VG460			Klübersynth GH 6-460			
-25	+60		VG 220	Mobil Gly-goyle 220	Shell Tivela S4 WE 220	Klübersynth GH 6-220	Cater SY 220	BP Energol SG-XP 220	
-15	+60	CLP HC	VG460	Mobil SHC 634	Shell Omala S4 GX 460	Klübersynth GEM 4-460N	Cater SH 460		L-CKT460
-25	+40		VG 220	Mobil SHC 630	Shell Omala S4 GX 220	Klübersynth GEM 4-220N	Cater SH 220		L-CKT220
-30	+30		VG 150	Mobil SHC 629	Shell Omala S4 GX 150	Klübersynth GEM 4-150N	Cater SH 150		L-CKT150
-40	+20		VG68	Mobil SHC 626	Shell Omala S4 GX 68				
-15	+40	HCE	VG 460		Shell Cassida Fluid GL460	Klüberoil 4UH1-460N			
-20	+40	E	VG 320			Klüberbio EG2-320			

### 9.3 齿轮润滑油加注量

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镜或油位螺塞所指示的精确油量。

下表中列出了安装方式 M1 ~ M6 的减速器相应的标准参考润滑油注入量值。

#### 斜齿轮（R 系列）减速器

R... / R..F..系列

减速器 型号	加注量 单位：升					
	M1 <sup>1)</sup>	M2 <sup>1)</sup>	M3	M4	M5	M6
17	0.25	0.55	0.35	0.55	0.35	0.4
27	0.25/0.4	0.7	0.5	0.7	0.5	0.5
37	0.3/0.95	0.85	0.95	1.05	0.75	0.95
47	0.7/1.5	1.6	1.5	1.65	1.5	1.5
57	0.8/1.7	1.9	1.7	2.1	1.7	1.7
67	1.1/2.3	2.4	2.8	2.9	1.8	2
77	1.2/3	3.3	3.6	3.8	2.5	3.4
87	2.3/6	6.5/8.1	7.4	7.4	6.4	6.6
97	4.6/9.8	11	11.7	13.4	11.3	11.7
107	6/13.7	16.3	16.9	19.2	13.2	15.9
127	6.4/17	18.3	18.2	22	16.8	17.9
127T	7/18.7	20.1	20	24.2	18.5	19.7
137	10/25	28	29.5	31.5	25	25
147	15.4/40	46.5	48	52	39.5	41
167	27/70	82	78	88	66	69

1) 在双联减速器中，较大的减速器必须加注更多的润滑油油量。

## RF.. / RZ.. / RM.. 系列

减速器 型号	加注量 单位：升					
	M1 <sup>1)</sup>	M2 <sup>1)</sup>	M3	M4	M5	M6
17	0.25	0.55	0.35	0.55	0.35	0.4
27	0.25/0.4	0.7	0.5	0.7	0.5	0.5
37	0.35/0.95	0.9	0.95	1.05	0.75	0.95
47	0.65/1.5	1.6	1.5	1.6	1.5	1.5
57	0.8/1.7	1.8	1.7	2	1.7	1.7
67	1.2/2.5	2.5/3.2	2.7	2.8	1.9	2.1
77	1.20/2.5	3.1/4	3.3	3.6	2.4	3
87	2.4/6	6.5/8.2	7.3	7.4	6.4	6.5
97	5.1/10.2	11.9	11.2	14	11.2	11.8
107	6.3/14.9	15.9	17	19.2	13.1	15.9
127	6.6/16	18.3	18.2	21.4	15.9	17
127T	7.3/17.6	20.1	20	23.5	17.5	18.7
137	9.5/25.0	27	29	32.5	25	25
147	16.4/42.0	47	48	52	42	42
167	26.0/70.0	82	78	88	65	71

1) 在双联减速器中，较大的减速器必须加注更多的润滑油油量。

## RX.. 系列

减速器型 号	加注量 单位：升					
	M1	M2	M3	M4	M5	M6
57	0.6	0.8	1.3	1.3	0.9	0.9
67	0.8	0.8	1.7	1.4	1.1	1.1
77	1.1	1.5	2.6	2.7	1.6	1.6
87	1.7	2.5	4.8	4.8	2.9	2.9
97	2.1	3.4	7.4	7	4.8	4.8
107	3.9	5.6	11.6	11.9	7.7	7.7

## RXF..系列

减速器型号	加注量 单位：升					
	M1	M2	M3	M4	M5	M6
57	0.5	0.8	1.1	1.1	0.7	0.7
67	0.7	0.8	1.5	1.4	1	1
77	0.9	1.3	2.4	2	1.6	1.6
87	1.6	1.95	4.9	3.95	2.9	2.9
97	2.1	3.7	7.1	6.3	4.8	4.8
107	3.1	5.7	11.2	9.3	7.2	7.2

## 平行轴-斜齿轮 (F 系列) 减速器

F../FAB../FHB../FVB..:

减速器型号	加注量 单位：升					
	M1	M2	M3	M4	M5	M6
27	0.6	0.8	0.65	0.7	0.6	0.6
37	0.95	1.25	0.7	1.25	1	1.1
47	1.5	1.8	1.1	1.9	1.5	1.7
57	2.25	3.15	1.65	3.15	2.4	2.5
67	2.7	3.8	1.9	3.8	2.9	3.2
77	5.9	7.3	4.3	8	6	6.3
87	10.8	13	7.7	13.8	10.8	11
97	18.5	22.5	12.6	25.2	18.5	20
107	24.5	32	19.5	37.5	27	27
127	39.5	51.7	31.5	60.1	45.6	44.2
157	69	104	63	105	86	78

FF..:

减速器型号	加注量 单位: 升					
	M1	M2	M3	M4	M5	M6
27	0.6	0.8	0.65	0.7	0.6	0.6
37	1	1.25	0.7	1.3	1	1.1
47	1.6	1.85	1.1	1.9	1.5	1.7
57	2.3	3.1	1.7	3.1	2.3	2.4
67	2.7	3.8	1.9	3.8	2.9	3.2
77	5.9	7.3	4.3	8.1	6	6.3
87	10.8	13.2	7.8	14.1	11	11.2
97	19	22.5	12.6	25.6	18.9	20.5
107	25.5	32	19.5	38.5	27.5	28
127	40.6	51	31.5	61.2	46.3	44.9
157	72	105	64	106	87	79

FA(H/V)..., FA(H/V)F.., FA(H/V)Z..:

减速器型号	加注量 单位: 升					
	M1	M2	M3	M4	M5	M6
27	0.6	0.8	0.65	0.7	0.6	0.6
37	0.95	1.25	0.7	1.25	1	1.1
47	1.5	1.8	1.1	1.9	1.5	1.7
57	2.7	3.5	2.1	3.4	2.9	3
67	2.7	3.8	1.9	3.8	2.9	3.2
77	5.9	7.3	4.3	8	6	6.3
87	10.8	13	7.7	13.8	10.8	11
97	18.5	22.5	12.6	25.2	18.5	20
107	24.5	32	19.5	37.5	27	27
127	38.3	50.9	31.5	59.7	44.7	43.3
157	68	103	62	104	85	77

## 斜齿轮- 锥齿轮 (K 系列) 减速器

K../KAB../KHB../KVB..:

减速器 型号	加注量 单位: 升					
	M1	M2	M3	M4	M5	M6
37	0.5	1	1	1.25	0.95	0.95
47	0.8	1.3	1.5	2	1.6	1.6
57	1.1	2.2	2.2	2.8	2.3	2.1
67	1.1	2.4	2.6	3.45	2.6	2.6
77	2.2	4.1	4.4	5.8	4.2	4.4
87	3.7	8	8.7	10.9	8	8
97	7	14	15.7	20	15.7	15.5
107	10	21	25.5	33.5	24	24
127	21	41.5	44	54	40	41
157	31	65	68	90	62	63
167	33	97	109	127	89	86
187	53	156	174	207	150	147

KF..:

减速器 型号	加注量 单位: 升					
	M1	M2	M3	M4	M5	M6
37	0.5	1.1	1.1	1.5	1	1
47	0.8	1.3	1.7	2.2	1.7	1.6
57	1.2	2.2	2.4	3.15	2.5	2.3
67	1.1	2.4	2.8	3.7	2.7	2.7
77	2.1	4.1	4.4	5.9	4.5	4.5
87	3.7	8.2	9	11.9	8.4	8.4
97	7	14.7	17.3	21.5	15.7	15.7
107	10	21.8	25.8	35.1	25.2	25.2
127	21	41.5	46	55	41	41
157	31	66	69	92	62	63

KA../KH../KV../ KA(H/V)F../KA(H/V)Z..

减速器型 号	加注量 单位：升					
	M1	M2	M3	M4	M5	M6
37	0.5	1	1	1.4	1	1
47	0.8	1.3	1.6	2.15	1.6	1.6
57	1.2	2.2	2.4	3.15	2.7	2.4
67	1.1	2.4	2.7	3.7	2.6	2.6
77	2.1	4.1	4.6	5.9	4.4	4.4
87	3.7	8.2	8.8	11.1	9.2	8
97	7.0	14.7	15.7	20	14	15.7
107	10	20.5	24	32.4	26.5	24
127	21	41.5	43	52	42	40
157	31	65	68	90	62	63
167	33	97	109	127	89	86
187	53	156	174	207	150	147

### 斜齿轮- 蜗轮蜗杆 (S 系列) 减速器

S..:

减速器型 号	加注量 单位：升					
	M1	M2	M3 <sup>1)</sup>	M4	M5	M6
37	0.25	0.4	0.5	0.55	0.4	0.4
47	0.35	0.8	0.7/0.9	1.03	0.8	0.8
57	0.5	1.2	1/1.2	1.43	1.3	1.3
67	1	2	2.2/3.1	3.1	2.6	2.6
77	1.9	4.2	3.7/5.4	5.9	4.4	4.4
87	3.3	8.1	6.9/10.4	11.3	8.4	8.4
97	6.8	15	13.4/18	21.8	17	17

1) 在双联减速器中，较大的减速器必须加注更多的润滑油油量。

SF..:

减速器型号	加注量 单位：升					
	M1	M2	M3 <sup>1)</sup>	M4	M5	M6
37	0.25	0.4	0.5	0.55	0.6	0.4
47	0.4	0.9	0.9/1.05	1.08	1.13	1
57	0.5	1.2	1/1.5	1.48	1.53	1.4
67	1	2.2	2.3/3	3.2	3.5	2.7
77	1.9	4.1	3.9/5.8	6.5	7.2	4.9
87	3.8	8	7.1/10.1	12	13.2	9.1
97	7.4	15	13.8/18.8	23.1	25.2	18

1) 在双联减速器中，较大的减速器必须加注更多的润滑油油量。

SA../SH../SAF../SHF../SAZ../SHZ..:

减速器型号	加注量 单位：升					
	M1	M2	M3 <sup>1)</sup>	M4	M5	M6
37	0.25	0.4	0.5	0.5	0.4	0.4
47	0.4	0.8	0.7/0.9	1.03	0.8	0.8
57	0.5	1.1	1/1.5	1.43	1.2	1.2
67	1	2	1.8/2.6	2.9	2.5	2.5
77	1.8	3.9	3.6/5	5.8	4.5	4.5
87	3.8	7.4	6/8.7	10.8	8	8
97	7	14	11.4/16	21	15.7	15.7

1) 在双联减速器中，较大的减速器必须加注更多的润滑油油量。

## 宁波东力传动设备有限公司

NINGBO DONLY TRANSMISSION EQUIPMENT CO.,LTD.

地址：宁波市江北区银海路 1 号

电话：+86-574-8839 8888

传真：+86-574-8839-8999

服务热线：400-168-6666

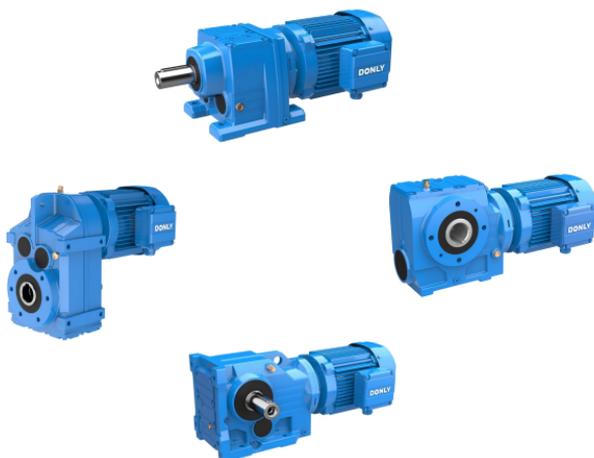
邮编：315033

网址：[Http://www.donly.com](http://www.donly.com)



**DONLY TRANSMISSION**

## Assembly and Operating Instructions



**Gear Unit Series R./F./K./S..**

Edition 2025

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**DONLY TRANSMISSION**

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## Contents

Contents .....	1
1 Important Notes .....	3
2 Safety Notes .....	5
3 Gear Unit Structure .....	9
3.1 Basic structure of R series helical gear units .....	9
3.2 Basic structure of F series parallel shaft helical gear units .....	10
3.3 Basic structure of K series helical-bevel gear units .....	11
3.4 Basic structure of S series helical-worm gear units .....	12
4 Mechanical Installation .....	13
4.1 Required tools /Auxiliary material .....	13
4.2 Prerequisites for assembly .....	13
4.3 Notes on Installing the gear unit .....	14
4.4 Gear unit with solid shaft .....	17
4.5 Torque arms for shaft-mounted gear units .....	20
4.6 Mounting gear unit with key way or splined hollow shaft .....	23
4.7 Mounting gear units with shrink disc .....	28
4.8 Mounting oil expansion tank .....	31
4.9 Mounting motor for AM or SF adapter .....	32
5 Start up .....	34
5.1 Check the oil level .....	34
5.2 Start up of helical-worm gear units .....	34
5.3 Start up of helical, parallel shaft helical and helical-bevel gear units.....	35
6 Inspection and Maintenance .....	36
6.1 Inspection and maintenance intervals .....	36
6.2 Lubricant change intervals .....	37
6.3 Inspection and maintenance of the gear unit .....	37

7 Malfunctions .....	41
7.1 Gear unit malfunctions .....	41
8 Mounting Positions .....	42
8.1 General information on mounting positions.....	42
8.2 Key to the mounting position sheets .....	43
8.3 Mounting positions for R series helical gear motors .....	45
8.4 Mounting positions for RX series helical gear motors .....	47
8.5 Mounting positions for F series parallel shaft helical gear motors .....	49
8.6 Mounting positions for K series bevel-helical gear motors .....	52
8.7 Mounting positions for S series helical-worm gear motors .....	57
9 Lubricants .....	63
9.1 Anti-friction bearing greases .....	63
9.2 Lubricant for gear units .....	63
9.3 Lubricant fill quantities .....	66

# 1 Important Notes

Safety and warning instructions

Please follow the safety and warning instructions in this specification!

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**Electrical hazard**

Possible consequences: Severe or fatal injuries.



**Hazard**

Possible consequences: Severe or fatal injuries.



**Hazardous situation**

Possible consequences: Slight or minor injuries.



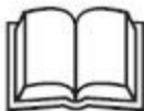
**Harmful situation**

Possible consequences: Damage to the drive and the environment.



Tips and useful information.

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You must adhere to the operating instructions to ensure:

- . Trouble-free operation
- . Fulfillment of any rights to claim under guarantee

Consequently, read the operating instructions before you start working with the gear unit!

The operating instructions contain important information about servicing. Therefore, keep the operating instructions close to the gear unit.



. Adjust the lubricant fill volume and position of the breather valve accordingly in the event of a change of mounting position (see Sec. "Lubricants" and "Mounting Positions").

. Follow the instructions in Sec. "Mechanical installation" / "Installing the gear unit"!

### **Waste disposal**

Please follow the latest instructions: Dispose of the following materials in accordance



with the regulations in force:

- . Steel scrap:
  - . Housing parts
  - . Gears
  - . Shafts
  - . Anti-friction bearing
  - . Gray-cast iron (if there is no special collection)
- . Parts of the worm gears are made of non-ferrous metals. Dispose of the worm gears as appropriate.
- . Collect waste oil and dispose of it correctly.

## 2 Safety Notes

### Preface

The following safety notes are primarily concerned with the use of gear units. If using gear motors, please also refer to the safety notes for motors in the relevant operating instructions.

**Please also consider the supplementary safety notes in the individual sections of these operating instructions.**

### Brief Introduction

During and after operation, gear motors, gear units and motors have:

- . Electrical parts
- . Moving parts
- . Hot surfaces

Only qualified staffs may carry out the following works:

- . Transportation
- . Putting into storage
- . Installation / assembly
- . Connection
- . Start up
- . Maintenance
- . Recondition

The following information and documents must be observed during these processes:

- . Relevant operating instructions and wiring diagrams
- . Warning and safety signs on the gear unit / gear motor
- . System-specific regulations and requirements
- . National / regional regulations governing safety and the prevention of accidents

## **Serious injuries and property damage may result from:**

- . Improper use
- . Incorrect installation or operation
- . Unauthorized removal of necessary protection covers or the housing

## **Designated use**

Gear motors / gear units from DONLY are intended for industrial systems.

They correspond to the applicable standards and regulations.

Technical data and information about the permitted conditions can be found on the nameplate and in the documentation.

It is essential that you follow all the instructions!

## **Transportation**

**Inspect the shipment for any damage that may have occurred in transit as soon as you receive the delivery. Inform the shipping company immediately. It may be that you are not permitted to start up the Rive due to the damage.**

Tighten installed eye bolts. The eye bolts are only designed for the weight of the gear motor / gear unit. Do not attach any additional loads.

The installed lifting eye bolts comply with DIN 580. The loads and regulations specified in this standard must always be observed. If two eye bolts are available, use both of them for transport. In this case, the tension force vector of the slings must not exceed a 45° angle in accordance with DIN 580.

Use suitable, sufficiently rated handling equipment if necessary. Remove any transportation fixtures prior to start up.

## **Extended storage of gear units**

Gear units of the "extended storage" type have:

- . An oil fill suitable for the mounting position so the unit is ready to run

(mineral oil CLP and synthetic oil CLP HC). You should still check the oillevel before start up (see Sec. "Inspection / Maintenance" / "Inspection and maintenance of the gear unit").

Comply with the storage conditions specified in the following table for extended storage:

Climate zone	Packaging <sup>1)</sup>	Storage location	Storage time
Temperate (Europe, USA, Canada, China and Russia, excluding tropical zones)	Packed in containers, with desiccant and moisture indicator sealed in the plastic wrap.	With roof, protected against rain and snow, no shock loads.	Up to three years with regular checks on the packaging and moisture indicator (relative atmospheric humidity < 50 %).
	Open	With roof, enclosed at constant temperature and atmospheric humidity (5 °C < t < 60 °C, < 50 % relative atmospheric humidity). No sudden temperature fluctuations and controlled ventilation with filter (free from dirt and dust). No aggressive vapors and no shock loads.	Two years or more given regular inspections. Check for cleanliness and mechanical damage as part of the inspection. Check corrosion protection.
Tropical (Asia, Africa, Central and South America, Australia, New Zealand excluding temperate zones)	Packed in containers, with desiccant and moisture indicator sealed in the plastic wrap. Protected against insect damage and mildew by chemical treatment.  Open	With roof, protected against rain, no shock loads.  With roof, enclosed at constant temperature and atmospheric humidity (5 °C < t < 60 °C, < 50 % relative atmospheric humidity). No sudden temperature fluctuations and controlled ventilation with filter (free from dirt and dust). No aggressive vapors and no shock loads. Protection against insect damage.	Up to three years with regular checks on the packaging and moisture indicator (relative atmospheric humidity < 50 %).  Two years or more given regular inspections. Check for cleanliness and mechanical damage as part of the inspection. Check corrosion protection.

1) Packaging must be performed by an experienced company using the packaging materials that have been expressly specified for the particular application.

### **Installation / assembly**

Observe the instructions in the sections "Installation" and "Assembly/Removal"!

### **Start up / operation**

Check that the direction of rotation is correct in decoupled status. Listen out for unusual grinding noises as the shaft rotates.

Secure the shaft keys for test mode without drive components. Do not render monitoring and protection equipment inoperative even for test mode.

Switch off the gear motor if in doubt whenever changes occur in relation to normal operation (e.g. increased temperature, noise, vibration). Determine the cause; contact **DONLY** if necessary.

### **Inspection / maintenance**

Follow the instructions in the section "Inspection and Maintenance"!

## 3 Gear Unit Structure



The following figures are block diagrams. Their purpose is only to make it easier to assign components to the spare parts lists. Discrepancies may occur depending on the gear unit size and version!

### 3.1 Basic structure of R series helical gear units

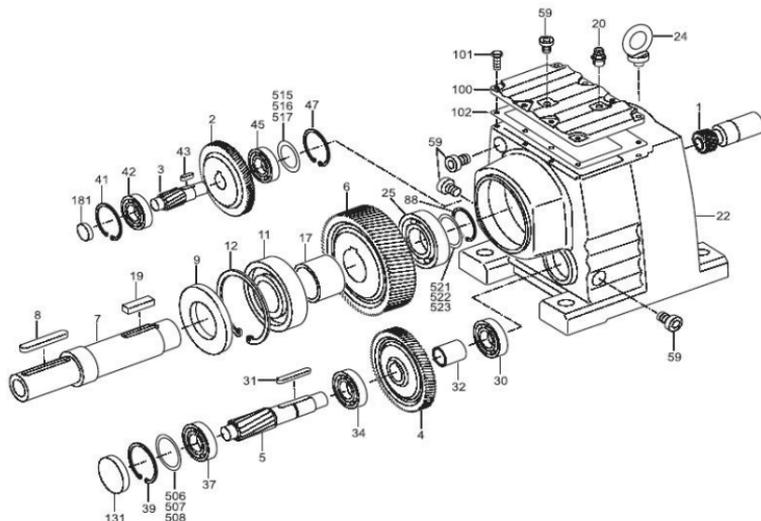


Figure 1: Basic structure of helical gear units

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#### Key

1 Pinion	19 Key	42 Anti-friction bearing	507 Shim ring
2 Gear	20 Breather valve	43 Key	508 Shim ring
3 Pinion shaft	22 Gearcase	45 Anti-friction bearing	515 Shim ring
4 Gear	24 Lifting eyebolt	47 Circlip	516 Shim ring
5 Pinion shaft	25 Anti-friction bearing	59 Screw plug	517 Shim ring
6 Gear	30 Anti-friction bearing	88 Circlip	521 Shim ring
7 Output shaft	31 Key	100 Gearcase cover	522 Shim ring
8 Key	32 Spacer	101 Hex head bolt	523 Shim ring
9 Oil seal	34 Anti-friction bearing	102 Gasket	
11 Anti-friction bearing	37 Anti-friction bearing	131 Closing cap	
12 Circlip	39 Circlip	181 Closing cap	
17 Spacer	41 Circlip	506 Shim ring	

## 3.2 Basic structure of F series parallel shaft helical gear units

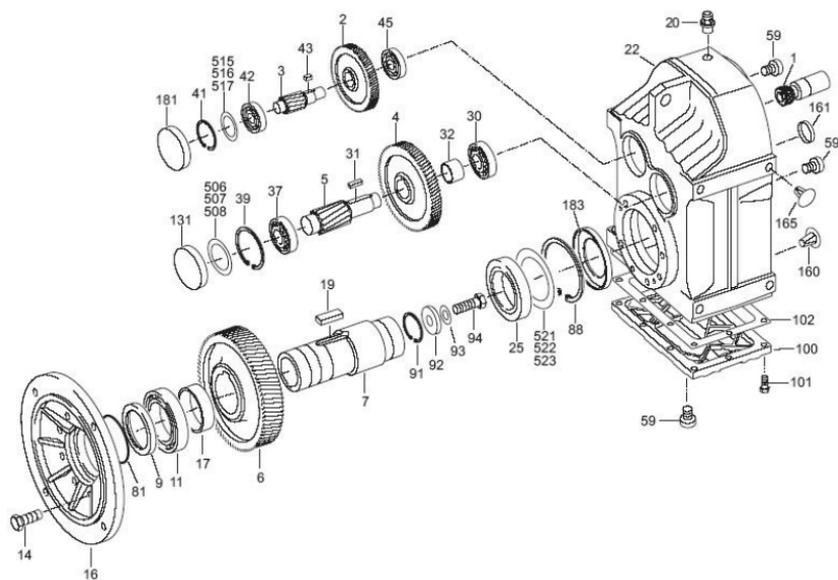


Figure 2: Basic structure of parallel shaft helical gear units

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### Key

1 Pinion	22 Gearcase	91 Circlip	506 Shim ring
2 Gear	25 Anti-friction bearing	92 Washer	507 Shim ring
3 Pinion shaft	30 Anti-friction bearing	93 Lock washer	508 Shim ring
4 Gear	31 Key	94 Hex head bolt	515 Shim ring
5 Pinion shaft	32 Spacer	100 Gearcase cover	516 Shim ring
6 Gear	37 Anti-friction bearing	101 Hex head bolt	517 Shim ring
7 Hollow shaft	39 Circlip	102 Gasket	521 Shim ring
9 Oil seal	41 Circlip	131 Closing cap	522 Shim ring
11 Anti-friction bearing	42 Anti-friction bearing	160 Closing plug	523 Shim ring
14 Hex head bolt	43 Key	161 Closing cap	
16 Output flange	45 Anti-friction bearing	165 Closing plug	
17 Spacer	59 Screw plug	181 Closing cap	
19 Key	81 O-ring	183 Oil seal	
20 Breather valve	88 Circlip		

### 3.3 Basic structure of K series helical-bevel gear units

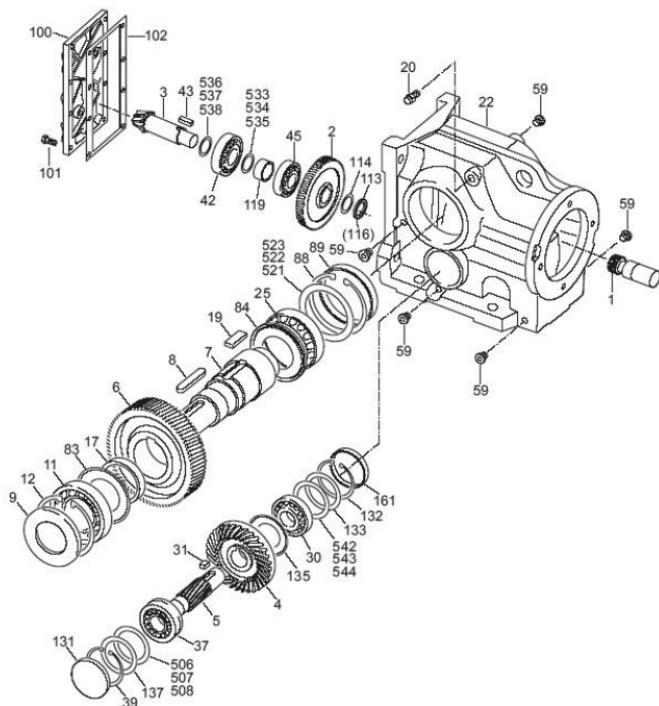


Figure 3: Basic structure of helical-bevel gear units

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#### Key

1 Pinion	25 Anti-friction bearing	102 Adhesive and sealing compound	522 Shim ring
2 Gear	30 Anti-friction bearing	113 Slotted round nut	523 Shim ring
3 Pinion shaft	31 Key	114 Multi-tang washer	533 Shim ring
4 Gear	37 Anti-friction bearing	116 Thread lock	534 Shim ring
5 Pinion shaft	39 Circlip	119 Spacer	535 Shim ring
6 Gear	42 Anti-friction bearing	131 Closing cap	536 Shim ring
7 Output shaft	43 Key	132 Circlip	537 Shim ring
8 Key	45 Anti-friction bearing	133 Spacer	538 Shim ring
9 Oil seal	59 Screw plug	135 Nilos ring	542 Shim ring
11 Anti-friction bearing	83 Nilos ring	161 Closing cap	543 Shim ring
12 Circlip	84 Nilos ring	506 Shim ring	544 Shim ring
17 Spacer	88 Circlip	507 Shim ring	
19 Key	89 Closing cap	508 Shim ring	
20 Breather valve	100 Gearcase cover	521 Shim ring	
22 Gearcase	101 Hex head bolt	521 Shim ring	

### 3.4 Basic structure of S series helical-worm gear units

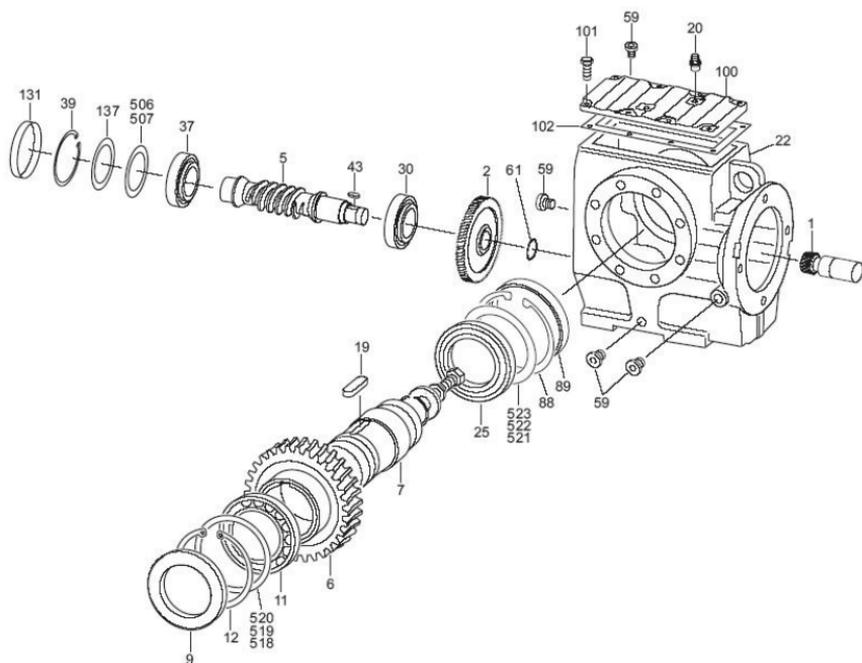


Figure 4: Basic structure of helical-worm gear units

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#### Key

1	Pinion	20	Breather valve	88	Circlip	518	Shim ring
2	Gear	22	Gearcase	89	Closing cap	519	Shim ring
5	Worm	25	Anti-friction bearing	100	Gearcase cover	520	Shim ring
6	Worm gear wheel	30	Anti-friction bearing	101	Hex head bolt	521	Shim ring
7	Output shaft	37	Anti-friction bearing	102	Rubber seal	522	Shim ring
9	Oil seal	39	Circlip	131	Closing cap	523	Shim ring
11	Anti-friction bearing	43	Key	137	Spacer		
12	Circlip	59	Screw plug	506	Shim ring		
19	Key	61	Circlip	507	Shim ring		

## 4 Mechanical Installation

### 4.1 Required tools /Auxiliary material

- . Torque wrench for:
- . Shrink discs
- . motor adapter
- . Input shaft assembly with centering shoulder
- . Mounting device
- . Shims and distance rings if necessary
- . Fixing devices for input and output elements
- . Lubricant
- . Bolt adhesive (for input shaft assembly with centering shoulder).
- . Standard parts are not parts of the delivery

### Installation tolerances

Shaft end	Flanges
Diameter tolerance in accordance with DIN 748 <ul style="list-style-type: none"><li>• ISO k6 for solid shafts with <math>\varnothing \leq 50</math> mm</li><li>• ISO m6 for solid shafts with <math>\varnothing &gt; 50</math> mm</li><li>• ISO H7 for hollow shafts</li><li>• Center bore in accordance with DIN 332, shape DR</li></ul>	Centering shoulder tolerance in accordance with DIN 42948 <ul style="list-style-type: none"><li>• ISO j6 with <math>b1 \leq 230</math> mm</li><li>• ISO h6 with <math>b1 &gt; 230</math> mm</li></ul>

### 4.2 Prerequisites for assembly

Check that the following conditions have been met:

- . The data on the nameplate of the gear motor matches the voltage supply system.
- . The drive has not been damaged during transportation or storage.
- . Ensure that the following requirements have been met:
  - **For standard gear units:**

Ambient temperature according to the lubricant table in Sec. "Lubricants" (see standard).

The drive must not be assembled in the following ambient conditions:

- . Potentially explosive atmosphere
- . Oil
- . Acids
- . Gas
- . Vapors
- . Radiation
- . For special versions:

The drive configured in accordance with the ambient conditions.

**. For helical-worm gear units:**

No large external mass moments of inertia which could exert a decelerative load on the gear unit.

[At  $\eta$ . (decelerative) =  $2-1/\eta < 0.5$  self-locking]

. You must clean the output shafts and flange surfaces thoroughly to ensure they are free of anti-corrosion agents, contamination or similar. Use a commercially available solvent. Do not let the solvent come into contact with the sealing lips of the oil seals danger of damage to the material!

. When the drive is installed in abrasive ambient conditions, protect the output end oil seals against wear.

**4.3 Notes on Installing the gear unit**

The gear unit or gear motor is only allowed to be installed in the specified mounting position.

The support structure must have the following characteristics:

- . Level
- . Vibration damping
- . Torsionally rigid

Maximum permitted flatness error for foot and flange mounting (approximate values with reference to DIN ISO):

- . Gear unit size 16 ... 67: max. 0.4 mm
- . Gear unit size 77 ... 107: max. 0.5 mm
- . Gear unit size 127 ... 147: max. 0.7 mm
- . Gear unit size 157 ... 187: max. 0.8 mm

Do not tighten the housing legs and mounting flanges against one another and ensure that you comply with the permitted overhung and axial loads!

Secure the gear motors with bolts of quality 8.8.

Secure the following gear motors with bolts of quality 10.9:

- RF37 with flange  $\phi 120$  mm
- RF47 with flange  $\phi 140$  mm
- RF57 with flange  $\phi 160$  mm
- RF147 with flange  $\phi 450$  mm
- RF167 with flange  $\phi 550$  mm



**The oil checking and drain screws and the breather valves must be freely accessible!**

At the same time, also check that the oil fill is as specified for the mounting position (see Sec. "Lubricants" / "Lubricant fill quantities" or refer to the information on the nameplate).

The gear units are filled with the required oil volume at the factory. There may be slight deviations at the oil level plug as a result of the mounting position, which are permitted within the manufacturing tolerances.

**Adjust the lubricant fill volumes and the position of the breather valve accordingly in the event of a change of mounting position.**

Please contact our **DONLY** customer service if you change the mounting position of K gear units to M5 or M6 or between M5 and M6.

Please contact our DONLY customer service if you change the mounting position of size S47 to S97 gear units to mounting position M2.

Please contact our DONLY customer service if you change the mounting position of R gear units to mounting position M2.

Use plastic inserts (2 ... 3 mm thick) if there is a risk of electrochemical corrosion between the gear unit and the driven machine. The material used must have an electrical bleeder resistor  $< 10^9\Omega$ . Electrochemical corrosion can occur between various metals, for example, cast iron and high-grade steel. Also install the bolts with plastic washers! Ground the housing additionally . use the grounding bolts on the motor.

### **Installation in damp locations or in the open**

Drives are supplied in corrosion-resistant versions for use in damp areas or in the open air. Repair any damage to the paint work (e.g. on the breather valve).

When mounting the motors onto AM and SF adapters, seal the flange areas with a suitable sealing compound, e.g. Loctite. 574.

### **Gear unit venting**

No breather plug is required for the following gear units:

. R00, R01 and F00 in mounting positions M1, M3, M5 and M6

DONLY supplies all other gear units with the breather valve installed and activated according to the particular mounting position.

### **Exceptions:**

1. DONLY supplies the following gear units with a screw plug on the vent hole provided:

- . Gear units for extended storage
- . Pivoted mounting positions, if possible
- . Gear units for mounting on a slant

The breather valve is placed together with accessory. Before start up, you must replace the highest screw plug with the breather valve supplied.

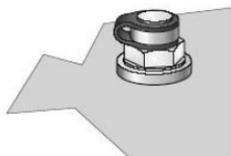
2. **DONLY** supplies a breather valve in a plastic bag for gear head units requiring venting on the input end.

3. **Enclosed gear units** are supplied without a breather valve.

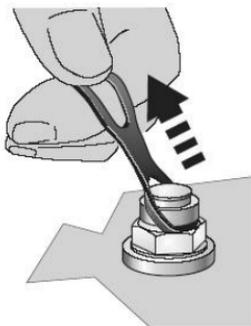
### Activating the breather valve

As a rule, the breather valve is already activated at the factory. If the breather valve has not been activated, you must remove the transport fixture from the breather valve before starting up the gear unit!

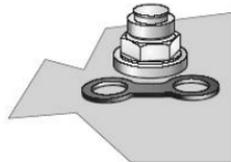
1. Breather valve with transport fixture



2. Remove the transport fixture



3. Breather valve activated



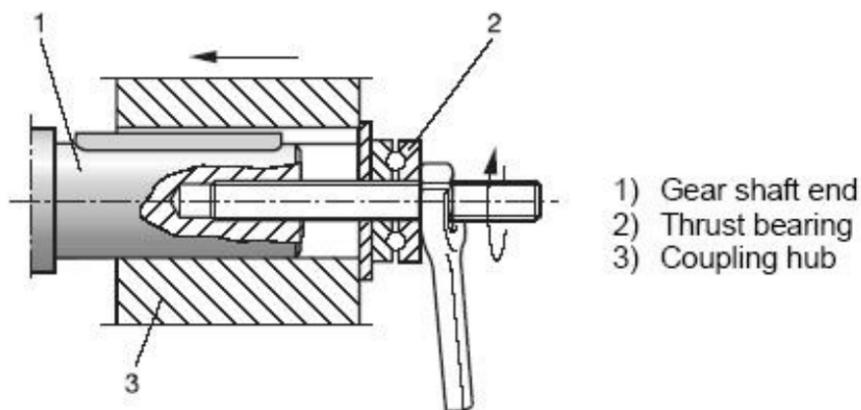
### Painting the gear unit

If you paint or respray the drive, ensure that you cover the breather valve and oil seals carefully. Remove the strips of tape after completing the painting work.

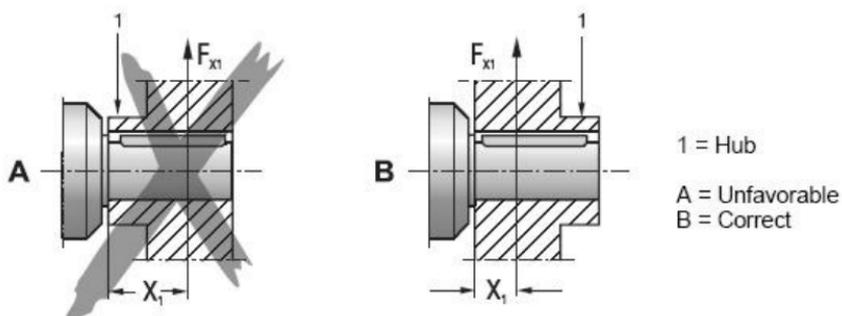
## 4.4 Gear unit with solid shaft

### Installing input and output elements

The following figure shows a mounting device for installing couplings or hubs on gear unit or motor shaft ends. It may be possible to dispense with the thrust bearing on the mounting device.



Avoid inadmissibility high overhung loads: Install the gear or chain sprocket according to figure B.



. Only use a mounting device for installing input and output elements. Use the center bore and the thread on the shaft end for positioning.



. **Never drive belt pulleys, couplings, pinions, etc. onto the shaft end by hitting them with a hammer This will damage the bearings, housing and the shaft!**

. **In the case of belt pulleys, make sure the belt is tension correctly in accordance with the manufacturer's instructions.**

. Power transmission elements should be balanced after fitting and must not give rise to any impermissible radial or axial forces (see the "Gear motor" or "Explosion-Proof Drives" catalogs for permitted values).

**Note:**



Assembly is easier if you first apply lubricant to the output element or heat it up briefly (to 80 ... 100 °C). If the heating temperature exceeds 100°C, there is a risk of scalding the oil deal, so please pay attention to protection.

**Installing couplings**

Couplings must be mounted and balanced according to the information provided by the coupling manufacturer:

- a) Maximum and minimum clearance
- b) Radial misalignment
- c) Angular misalignment

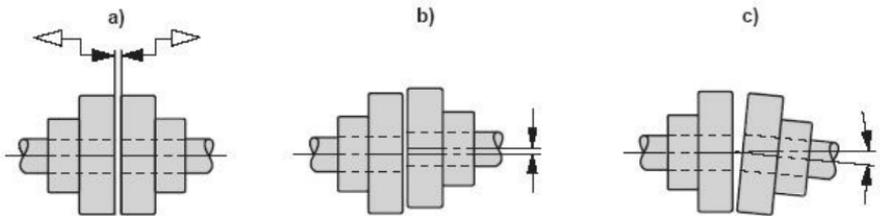


Fig: Clearance and misalignment for coupling installation

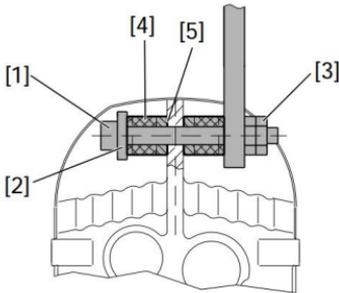


**Input and output elements such as belt pulleys, couplings, etc. must be protected against contact!**

#### **4.5 Torque arms for shaft-mounted gear units**

##### **Parallel shaft helical gear units**

Do not place torque arms under strain during installation! The following figure shows the torque arm for parallel shaft helical gear unit.



- [1] Screw
- [2] Washer
- [3] Nuts
- [4] Rubber buffer
- [5] Metal side of the rubber buffer

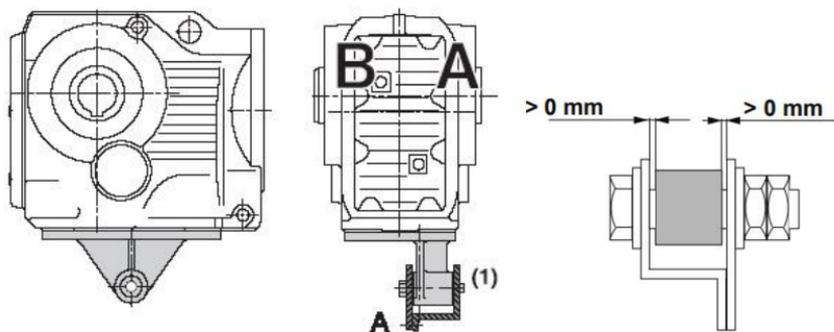
Proceed as follows:

1. Make sure that the metal sides of the rubber buffers lay against the gear unit.
2. Install bolt and nut.
3. Tighten the bolt until the length deformation of one rubber buffer meets the following requirements.

F..series gear units	$\Delta L$ / mm
27~37	1
47~87	1.5
97~107	2
127~157	3

### Helical-bevel gear units

The following figure shows the torque arm for helical-bevel gear units. .



Do not deform the torque arm during installation. The following illustration shows a bushing attached at both sides without tightening.

Table: Torque arm tightening torques for helical-bevel gear units.

Gearbox Type	Bolts	Tightening Torque
KA37	4 × M10 × 25 -8.8	48 Nm
KA47	4 × M10 × 30- 8.8	48 Nm
KA57	4 × M12 × 35- 8.8	86 Nm
KA67	4 × M12 × 35- 8.8	86 Nm
KA77	4 × M16 × 40 -8.8	210 Nm
KA87	4 × M16 × 40 - 8.8	210 Nm
KA97	4 × M20 × 50- 8.8	410 Nm
KA107	4 × M24 × 60 -8.8	710 Nm
KA127	4 × M36 × 130 - 8.8	2500 Nm
KA157	4 × M36 × 130 -8.8	2500 Nm

### Helical-worm gear units

The following figure shows the torque arm for helical-worm gear units. .

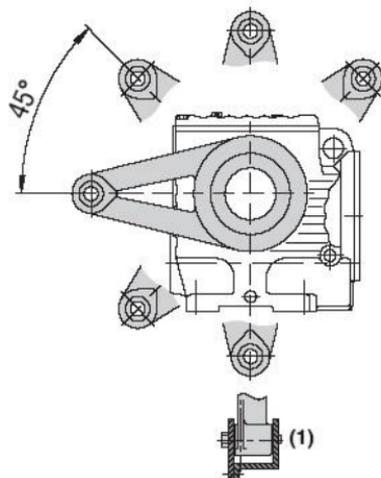


Table: Torque arm tightening torques fo helical-worm gear units

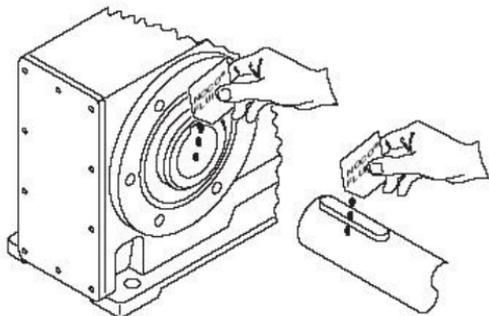
Gearbox Type	Bolts	Tightening Torque
SA37	M6 × 16- 8.8	11 Nm
SA47	M8 × 20 - 8.8	25 Nm
SA57	M8 × 20 -8.8	25 Nm
SA67	M12 × 25-8.8	86 Nm
SA77	M12 × 35 -8.8	86 Nm
SA87	M16 × 35- 8.8	210 Nm
SA97	M16 × 35- 8.8	210 Nm

#### 4.6 Mounting gear unit with key way or splined hollow shaft

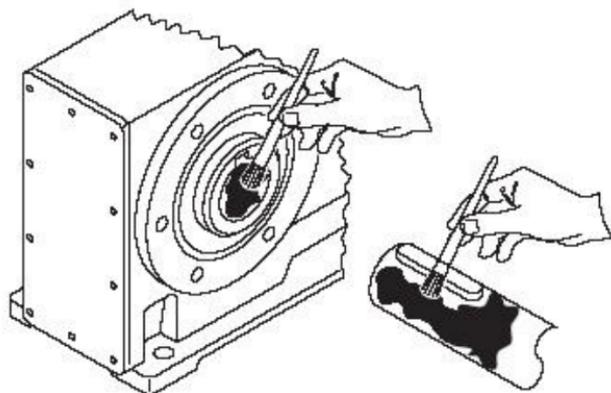


For the configuration of customer shafts, please also refer to the design notes in the Gear motors catalog!

1. Apply Grease.

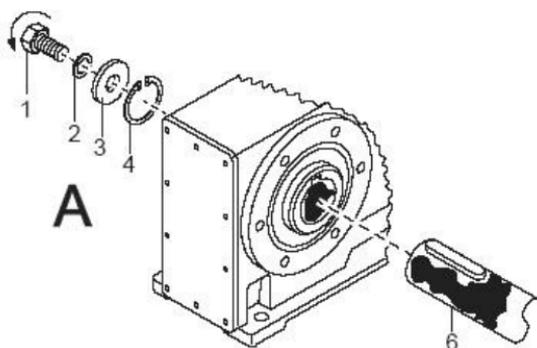


2. Distribute the Grease carefully.



3. Install the shaft and secure it axially. Mounting is easier by using a mounting device.

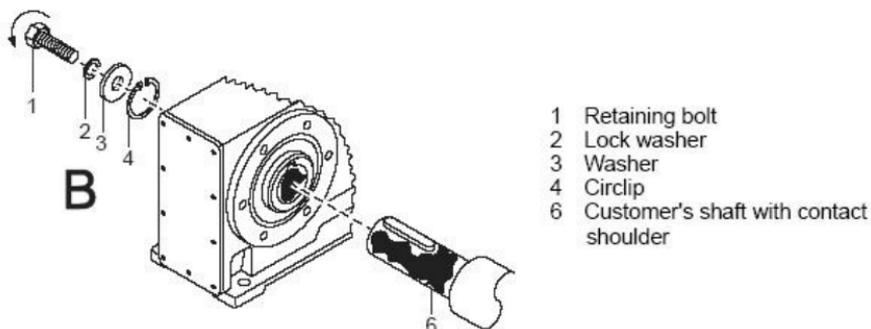
### 3A: Mounting with standard scope of delivery



- 1 Short retaining bolt  
(standard scope of delivery)
- 2 Lock washer
- 3 Washer
- 4 Circlip
- 6 Customer shaft

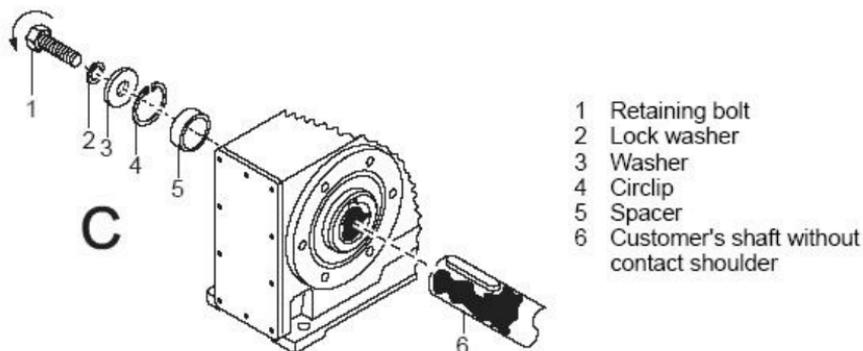
### 3B: Assembly with **ONLY** assembly/disassemble kit

. Customer's shaft with contact shoulder

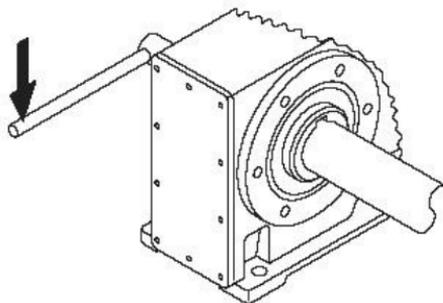


### 3C: Assembly with **ONLY** assembly/disassemble kit

. Customer's shaft without contact shoulder



4. Tighten the retaining bolt to the appropriate torque (see table).



Bolt	Tightening torque [Nm]
M5	5
M6	8
M10/12	20
M16	40
M20	80
M24	200



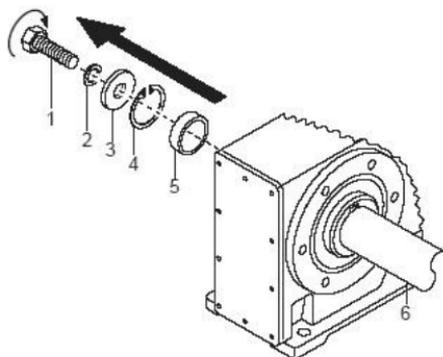
Note:

To avoid contact corrosion, we recommend that the customer's shaft should additionally be recessed between the two contact surfaces!

## Removal notes

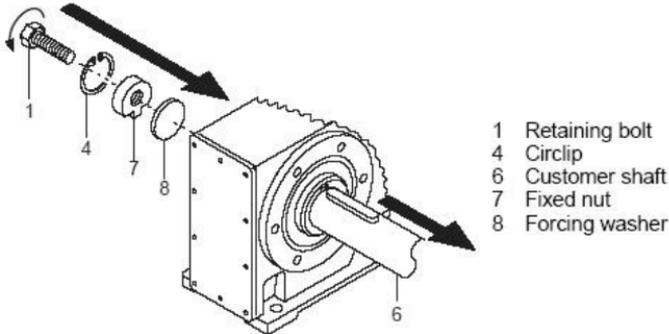
This description is only applicable when the gear unit was assembled using the installation/removal kit from DONLY (see the previous description, point 3B or 3C).

1. Loosen the retaining bolt [1].
2. Remove parts 2 to 4 and, if fitted, spacer 5.



- 1 Retaining bolt
- 2 Lock washer
- 3 Washer
- 4 Circlip
- 5 Spacer
- 6 Customer shaft

3. Insert the forcing washer [8] and the fixed nut [7] from the DONLY installation/removal kit between the customer's shaft [6] and the cir-clip[4].
4. Re-insert the Snap Ring. [4].
5. Screw the retaining bolt [1] back in. Now you can force the gear unit off the shaft by tightening the bolt.



### DONLY installation/removal kit

The DONLY installation/removal kit can be ordered under the following part number.

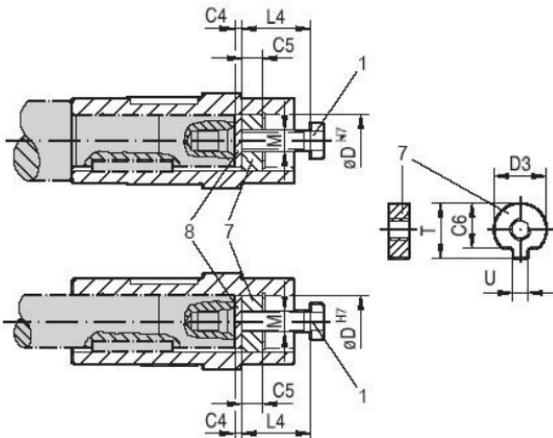


Fig: DONLY installation/removal kit

1 Retaining bolt

7 Fixed nut for disassemble

8 Forcing washer

M: Fixed Screw

You must always check whether this design can compensate the axial loads. In particular applications (e.g. mounting mixer shafts), a different design may have to be used to secure the shaft axially. In these cases, customers can use their own devices. However, you must ensure that these designs do not cause potential sources of combustion according to ISO.

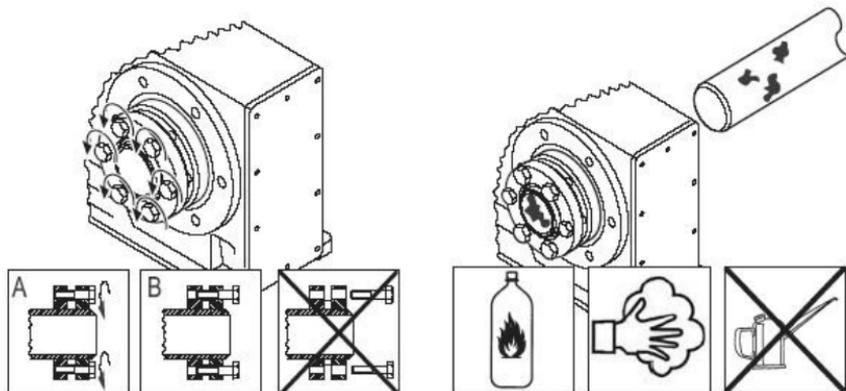
#### 4.7 Mounting gear units with shrink disc

##### Installation notes .

Do not tighten the locking bolts unless the shaft is installed - the hollow shaft could become deformed!

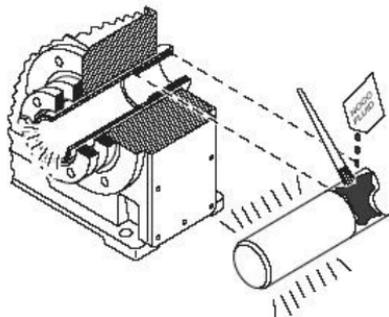
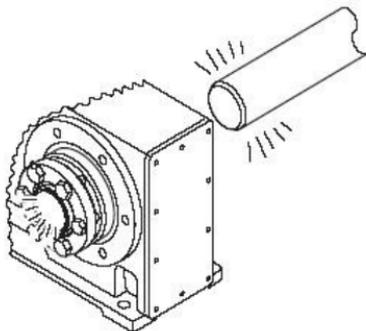
1. Loosen the locking bolts by a few turns (do not unscrew them completely!).

2. Carefully degrease the hollow shaft hole and the input shaft.



3. Hollow shaft/input shaft after degreasing

4. Apply NOCO® fluid to the input shaft<sup>1)</sup> in the area of the bushing.



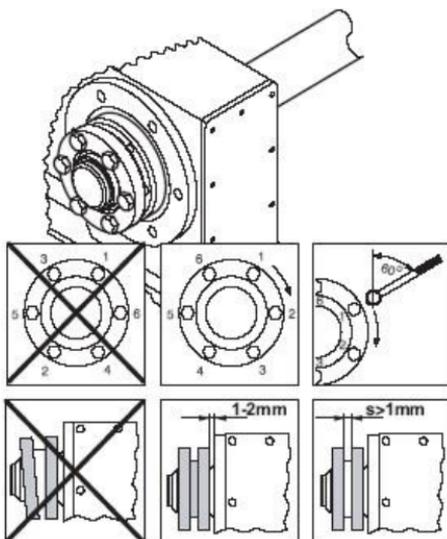
It is essential to make sure that the clamping area of the shrink disk is free from grease!

For this reason, never apply fluid directly to the bushing as the paste may be able to get into the clamping area of

the shrink disk when the input shaft is put on.

4. Install the input shaft, making sure that the locking collars of the shrink disk are installed in parallel to each other

5. For gear unit housing with a shaft collar, mount the shrink disc to the stop on the shaft collar. For gear unit housing without a shaft collar, mount the shrink disk with a clearance of 2 to 3 mm from the gear unit housing. Tighten the locking bolts with the torque wrench by working round several times from one bolt to the next (not in diametrically opposite sequence) until the bolts cannot be tightened any more. See the following table for tightening torque.



6. After installation, there must be gap  $s > 0$  mm between the locking collars

. Grease the outside of the hollow shaft in the area of the shrink disk to prevent corrosion.

Gear unit type	Bolt	Nm	◁Max <sup>1)</sup>
	M5	5	60°
KH37~KH77 FH37~FH77	M6	12	
KH87/97 FH87/97	M8	30	
KH107 FH107	M10	59	
KH127/157 FH127	M12	100	
KH167	M16	250	
KH187	M20	470	

1) Maximum tightening angle per cycle

**Notes on removing the shrink disk**

1. Unscrew the locking bolts evenly one after the other. Each locking bolt may only be unscrewed by about one quarter turn in the initial cycle. This is in order to avoid tilting and jamming the locking collars. Do not fully unscrew the locking bolts!
2. Remove the shaft or pull the hub off the shaft. (You must first remove any rust that may have formed between the hub and the end of the shaft.)
3. Pull the shrink disk off the hub.

Caution!

Risk of injury if the shrink disk is not removed correctly!

### **Cleaning and lubricating the shrink disk**

There is no need to strip down and re-grease disassembled shrink disks before they are screwed back on.

The shrink disk only needs to be cleaned and re-greased if it is contaminated.

Use one of the following solid lubricants for the tapered surfaces.

Lubricant (Mo S2)	Sold as
Molykote 321 (lube coat)	Spray
Molykote spray (powder spray)	Spray
Molykote G Rapid	Spray or paste
Aemasol MO 19P	Spray or paste
Aemasol DIO-sétral 57 N (lube coat)	Spray

Grease the locking bolts with a multipurpose grease such as Molykote BR 2 or similar.

### **4.8 Mounting oil expansion tank**

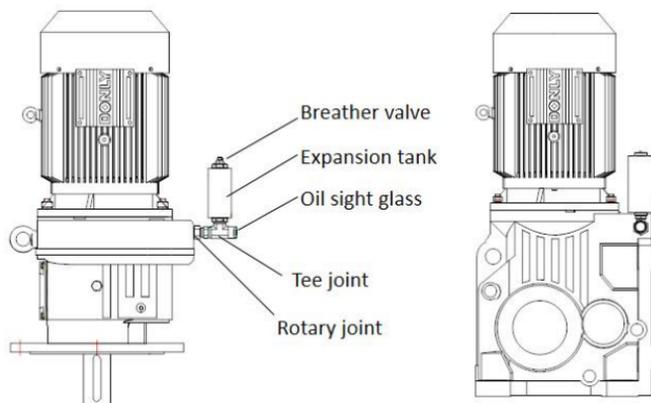
The oil fill level for gear units larger than size 107 in mounting position M4 is set due to technical reasons. In case of unfavorable circumstances, oil may leak from the breather valve of these gear units. Using an oil expansion tank provides additional space for the lubricant to expand.



Note that the oil expansion tank is not a default option.. It is only supplied as an accessory. If necessary, please indicate it in the ordering requirements.

Please install the expansion tank as shown in the picture below. The installation steps are as follows:

1. Install the rotary joint into the oil level plug hole of the housing and tighten it.
2. Adjust the tee joint to a vertical position, connect it with the rotating joint and tighten it.
3. Connect the oil expansion tank to the tee joint and tighten it.
4. Install and tighten the breather valve and oil sight glass.



#### **4.9 Mounting motor for AM or SF adapter**

Through the AM and SF adapter, DONLY reducer can be connected to IEC standard motors and servo motors. The DONLY adapter is set to be direct key connection, and the motor installation steps are as follows:

1. Apply an appropriate amount of grease to the motor shaft and the inner

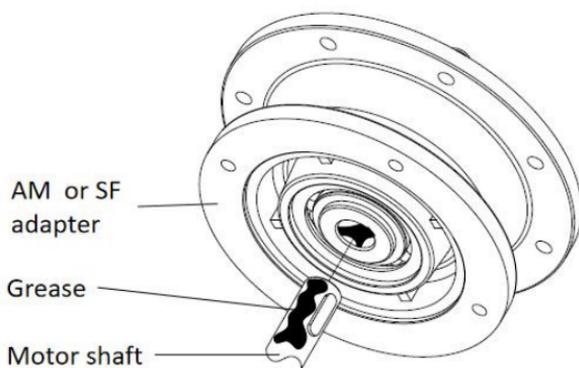
hole of the adapter, and spread it evenly to prevent rust and reduce assembly resistance.

2. For gear units used in humid environments, sealant (Loctite 207) should be applied to the flange joint surface to prevent corrosion of the joint surface and internal parts.

3. Align the motor shaft with the inner hole of the adapter, align the motor key with the keyway of the inner hole of the adapter, and push it in smoothly.

4. Install and tighten the bolts.

5. During the assembly process, it is prohibited to hit the reducer or motor with a hammer to avoid damage.



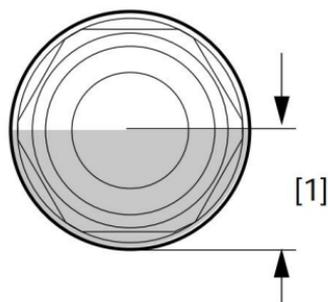
## 5 Start up

Prior to start up check that the oil level is as specified for the mounting position.

The oil checking and drain screws and the breather valves must be freely accessible.

### 5.1 Check the oil level

Check the oil level at the oil sight glass according to the following figure. The oil level must be within the range [1].



### 5.2 Start up of helical-worm gear units



Note: The direction of rotation of the output shaft in series S..7 helical-worm gear units has been changed from CW to CCW. Change direction of rotation: Swap over two motor intry cables.

#### Run-in period

helical-worm gear units require a run-in period of at least 48 hours before reaching their maximum efficiency. A separate run-in period applies for

each direction of rotation if the gear unit is operated in both directions of rotation. The table shows the average power reduction during the run-in period.

No. of starts	Worm	
	Power reduction	i range
1 start	ca. 12 %	ca. 50...280
2 start	ca. 6 %	ca. 20...75
3 start	ca. 3 %	ca. 20...90
4 start	-	-
5 start	ca. 3 %	ca. 6...25
6 start	ca. 2 %	ca. 7...25

### 5.3 Start up of helical, parallel shaft helical and helical-bevel gear units

No special start up instructions are required for helical, parallel shaft helical and helical bevel gear units providing the gear units have been installed in accordance with Sec. "Mechanical Installation".

# 6 Inspection and Maintenance

## 6.1 Inspection and maintenance intervals

Frequency	What to do?
. Daily working	<ul style="list-style-type: none"> <li>. Check oil temperature               <ul style="list-style-type: none"> <li>. For CLP , max. 90°C</li> <li>. For CLP HC: max. 100°C</li> </ul> </li> <li>. Check the noise</li> <li>. Check the oil leakage</li> </ul>
. After first start and running for 500~800 hours	<ul style="list-style-type: none"> <li>. Change the oil.</li> </ul>
. Every 3000 machine hours, at least every 6 months.	<ul style="list-style-type: none"> <li>. Check oil and oil level.</li> <li>. Check the seals visually for leakage.</li> <li>. For gear units with a torque arm: Check the rubber buffer and change it, if necessary</li> </ul>
<ul style="list-style-type: none"> <li>. Depending on the operating conditions (see chart below), every 3 years at the latest.</li> <li>. According to oil temperature.</li> </ul>	<ul style="list-style-type: none"> <li>. Change mineral oil.</li> </ul>
	<ul style="list-style-type: none"> <li>. Replace anti-friction bearing grease (recommendation).</li> <li>. Replace oil seal (do not install it in the same track).</li> </ul>
<ul style="list-style-type: none"> <li>. Depending on the operating conditions (see chart below), every 5 years at the latest.</li> <li>. According to oil temperature.</li> </ul>	<ul style="list-style-type: none"> <li>. Change synthetic oil</li> </ul>
	<ul style="list-style-type: none"> <li>. Replace anti-friction bearing grease (recommendation).</li> <li>. Replace oil seal (do not install it in the same track).</li> </ul>
. Varying (depending on external factors).	<ul style="list-style-type: none"> <li>. Touch up or renew the surface/anti corrosion coating.</li> </ul>

## 6.2 Lubricant change intervals

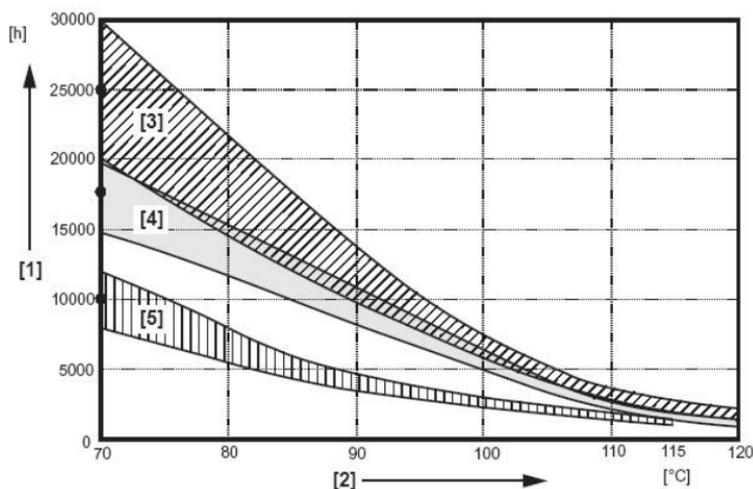


Fig: Oil change intervals for standard gear units under normal environmental conditions

[1] Operating hours

[3] CLP PG (PAG)

[2] Sustained oil bath temperature

[4] CLP HC (PAO)

. Average value per oil type at 70 °C

[5] CLP (mineral oil)

## 6.3 Inspection and maintenance of the gear unit



Do not intermix synthetic lubricants and do not mix synthetic and mineral lubricants together!

The standard lubricant is mineral oil.

**The position of the oil level and oil drain plug and the breather valve depends on the mounting position. Refer to the diagrams of the mounting positions.**

## Checking the oil level



**1. De-energize the gear motor and secure it to prevent it from being switched on inadvertently!**

**Wait until the gear unit has cooled off . Danger of burns!**

2. Refer to Sec. "Installing the gear unit" when changing the mounting position!

3. For gear units with an oil level plug: Remove the oil level plug, check the fill level and

correct it if necessary. Screw the oil level plug back in.

## Checking the oil



**1. De-energize the gear motor and secure it to prevent it from being switched on inadvertently!**

**Wait until the gear unit has cooled off . Danger of burns!**

2. Remove a little oil from the oil drain plug.

3. Check the oil consistency.

. Viscosity

. If you can see that the oil is heavily contaminated, we recommend that you change the oil even if this is outside the service intervals specified in "Inspection and maintenance periods".

4. For gear units with an oil level plug: Remove the oil level plug, check the fill level and correct it if necessary. Screw the oil level plug back in.

Changing the oil Only change the oil when the gear unit is at operating temperature.

## Changing the oil

Only change the oil when the gear unit is at operating temperature



**Switch off the gear motor and secure it to prevent it from being switched back on inadvertently!**

**Wait until the gear unit cools down - Danger of burns!**

**Note: The gear unit must still be warm otherwise the high viscosity of excessively cold oil will make it**

**harder to drain the oil correctly.**

### **With oil drain plug / oil level screw**

1. Place a container underneath the oil drain plug
2. Remove the oil level plug, breather plug/breather valve and oil drain plug.
3. Drain all the oil.
4. Screw in the oil drain plug.
5. Pour in new oil of the same type through the vent hole (if changing the oil type, please first contact our customer service). Do not mix synthetic lubricants.
  - . Pour in the volume of oil in accordance with the mounting position (see Sec. "Lubricant fill quantities") or as specified on the nameplate.
  - . Check at the oil level plug.
6. Screw the oil level plug back in
7. Screw in the breather plug/breather valve.

### **Without oil drain plug / oil level plug**

1. Remove cover plate.
2. Drain the oil through the cover plate opening.
3. Pour in new oil of the same type through the vent hole (if changing the oil type, please first contact our customer service). Do not mix synthetic lubricants.

. Pour in the volume of oil in accordance with the mounting position (see Sec. "Lubricant fill quantities") or as specified on the nameplate.

4. Check the oil level (→ Sec. "Check oil level for gear units with oil level plug")

5. Attach cover plate (observe the tightening torque and series → Sec. "Check the oil level for gear units without an oil level plug")

### **Changing the oil seal**



**1. Switch off the gear motor and secure it to prevent it from being switched on inadvertently!**

**Wait until the gear unit has cooled off . Danger of burns!**

2. When changing the oil seal, ensure that there is a sufficient grease reservoir between the dust lip and protective lip, depending on the type of gear unit.

3. If you use double oil seals, the space has to be filled one-third with grease.

# 7 Malfunctions

## Customer service

**Please have the following information to hand if you require the assistance of our customer service:**

- Data from the nameplate (complete)
- Nature and extent of the fault
- Time and peripheral circumstances of the fault
- Presumed cause

## 7.1 Gear unit malfunctions

Problem	Possible cause	Remedy
Unusual, regular running noise	A Meshing/grinding noise: Bearing damage. B Knocking noise: Irregularity in the gearing	A Check the oil (see Sec. "Inspection and Maintenance"), change bearings B Contact customer service
Unusual, irregular running noise	Foreign bodies in the oil	<ul style="list-style-type: none"><li>• Check the oil (see Sec. "Inspection and Maintenance")</li><li>• Stop the drive, contact customer service</li></ul>
Oil leaking <sup>1)</sup> <ul style="list-style-type: none"><li>• From the gear cover plate</li><li>• From the motor flange</li><li>• From the motor oil seal</li><li>• From the gear unit flange</li><li>• From the output end oil seal</li></ul>	A Rubber seal on the gear cover plate leaking B Seal defective C Gear unit not vented	A Tighten the bolts on the gear cover plate and observe the gear unit. Oil still leaking: Contact customer service B Contact customer service C Vent the gear unit (see Sec. "Mounting Positions")
Oil leaking from breather valve	A Too much oil B Drive operated in incorrect mounting position C Frequent cold starts (oil foams) and/or high oil level	A Correct the oil level (see Sec. "Inspection and Maintenance") B Mount the breather valve correctly (see Sec. "Mounting Positions") and correct the oil level (see "Lubricants")
Output shaft does not turn although the motor is running or the input shaft is rotated	Connection between shaft and hub in gear unit interrupted	Send in the gear unit/gearmotor for repair

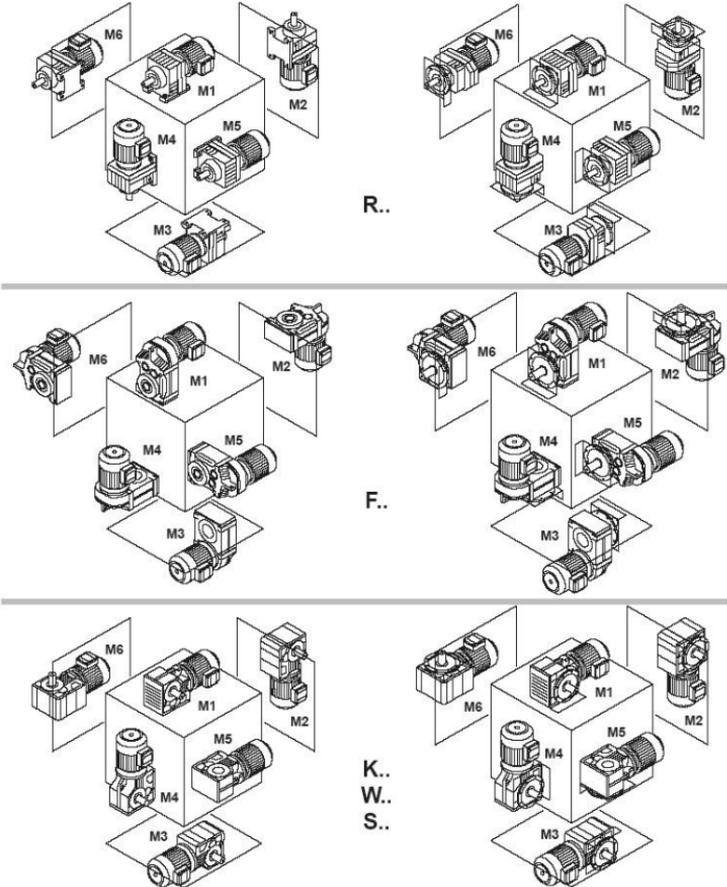
1) Short-term oil/grease leakage at the oil seal is possible in the run-in phase (24 hours running time).

# 8 Mounting Positions

## 8.1 General information on mounting positions

### Mounting position designation

DONLY differentiates between six mounting positions M1 ... M6 for gear units. The following figure shows the spatial orientation of the gear motor in mounting positions M1 ... M6.



## 8.2 Key to the mounting position sheets

### Symbols used

The following table shows the symbols used in the mounting position sheets and what they mean:

Symbol	Meaning
	Breather valve
	Oil level plug
	Oil drain plug

**\*In the mounting position (marked with \* in the figure), the first stage of the reducer is immersed in lubricating oil. When the input speed is high, the oil churning loss may increase, and the thermal power needs to be checked according to the actual situation. Please consult **DONLY** if necessary.**

### Churning losses

Increased churning losses may arise in some mounting positions. Contact **DONLY** in case of the following combinations:

Mounting	Gear unit type	Gear unit size	Input speed
M2, M4	R	97~107	>2500
		>107	>1500
M2, M3,M4,M5,M6	F	97~107	>2500
		>107	>1500
	K	77~107	>2500
		>107	>1500
	S	77~97	>2500

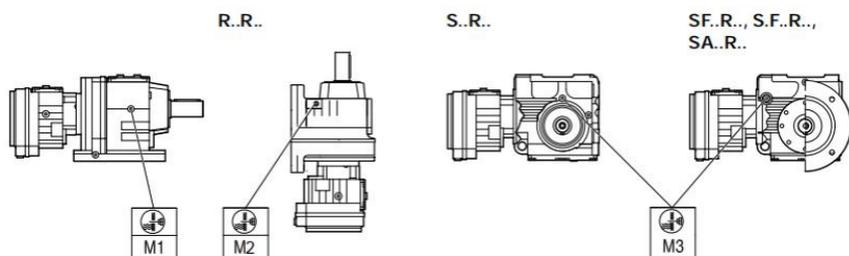
## Position of the oil level plug of compound gear units

To ensure sufficient lubrication for the first gear unit (larger gear unit) in the case of compound gear units, the following gear units have a higher oil level in the specified mounting positions:

Helical gear unit type R..R in mounting position M1 and M2.

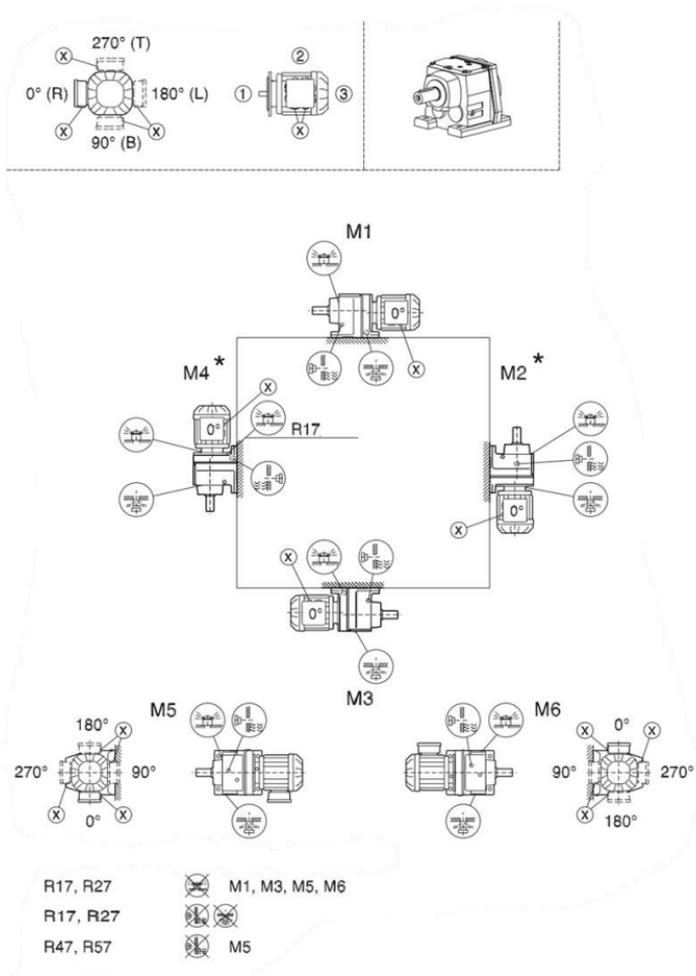
Helical-worm gear unit type S..R in mounting position M3

The oil level plugs are located at the following positions, deviating from the specifications on the mounting position sheets:

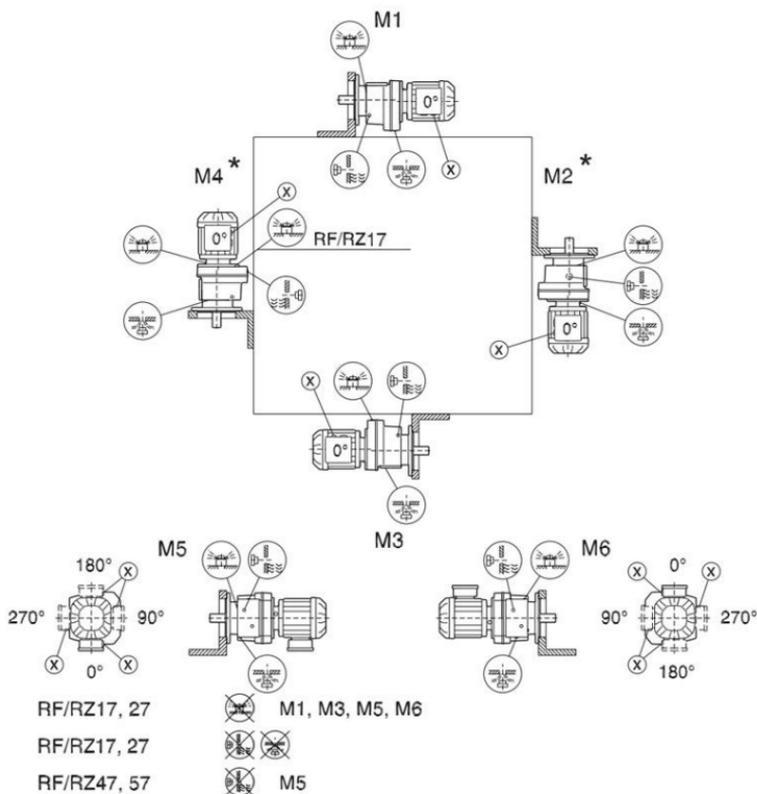
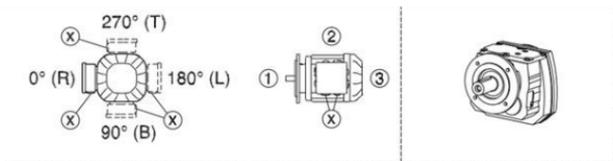


### 8.3 Mounting positions for R series helical gear motors

R17~167, R17F~R87F

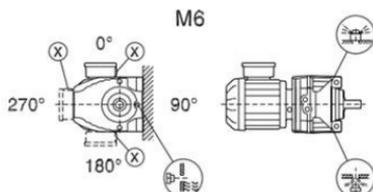
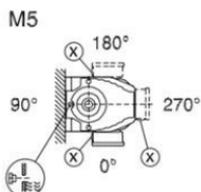
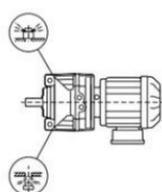
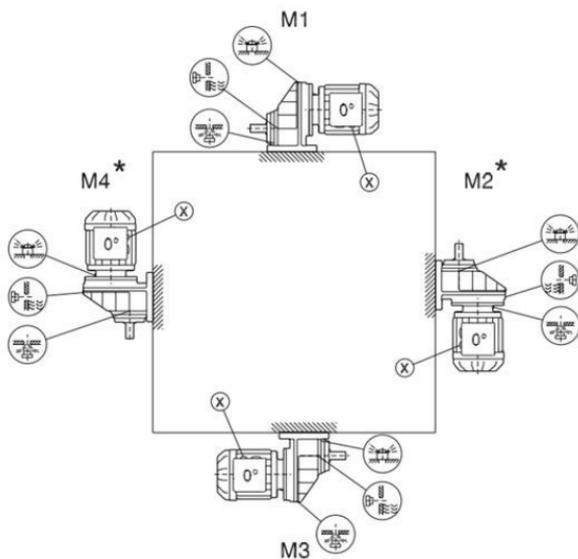
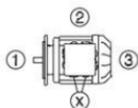
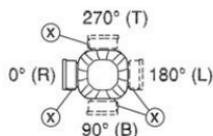


RF17~167, RZ17~87, RM57~167

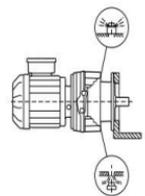
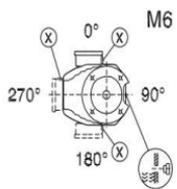
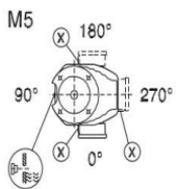
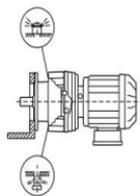
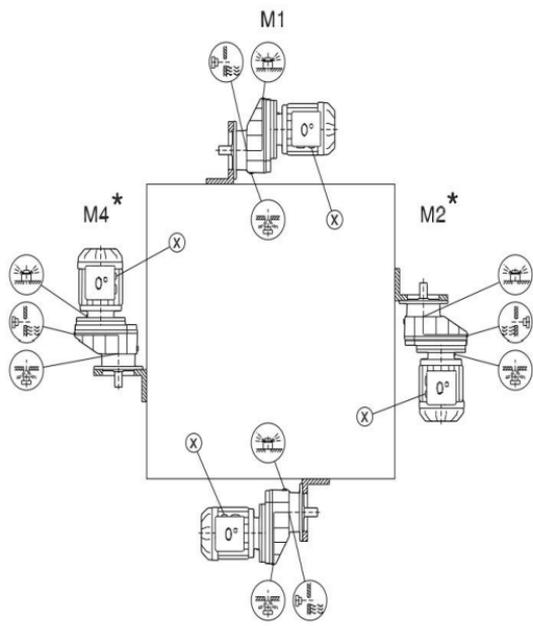
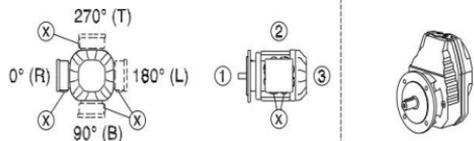


## 8.4 Mounting positions for RX series helical gear motors

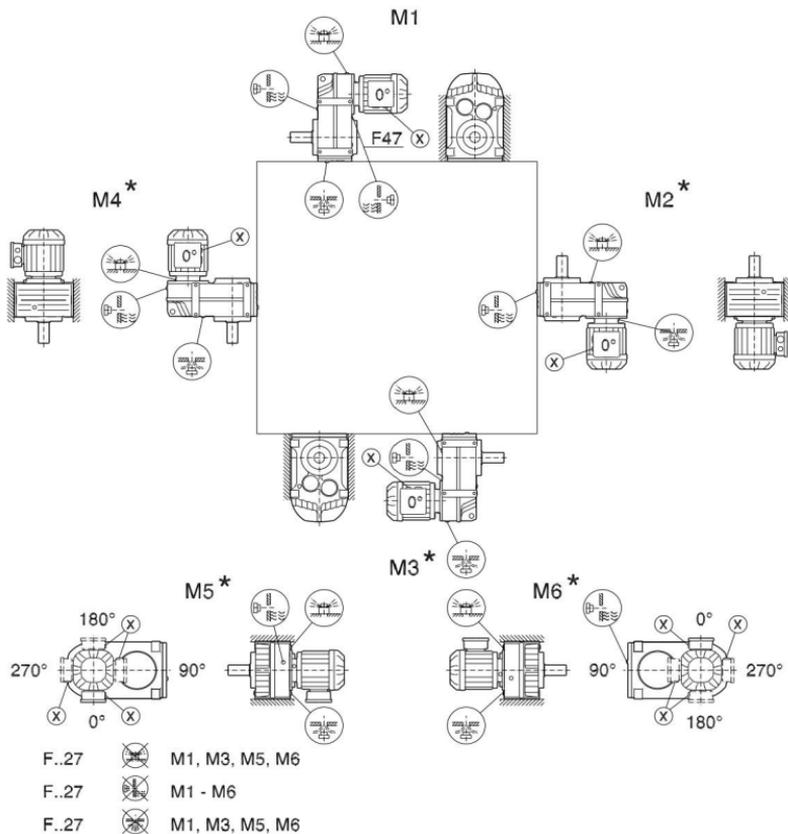
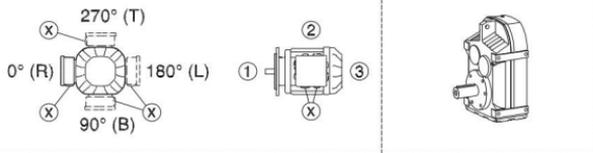
RX57~107



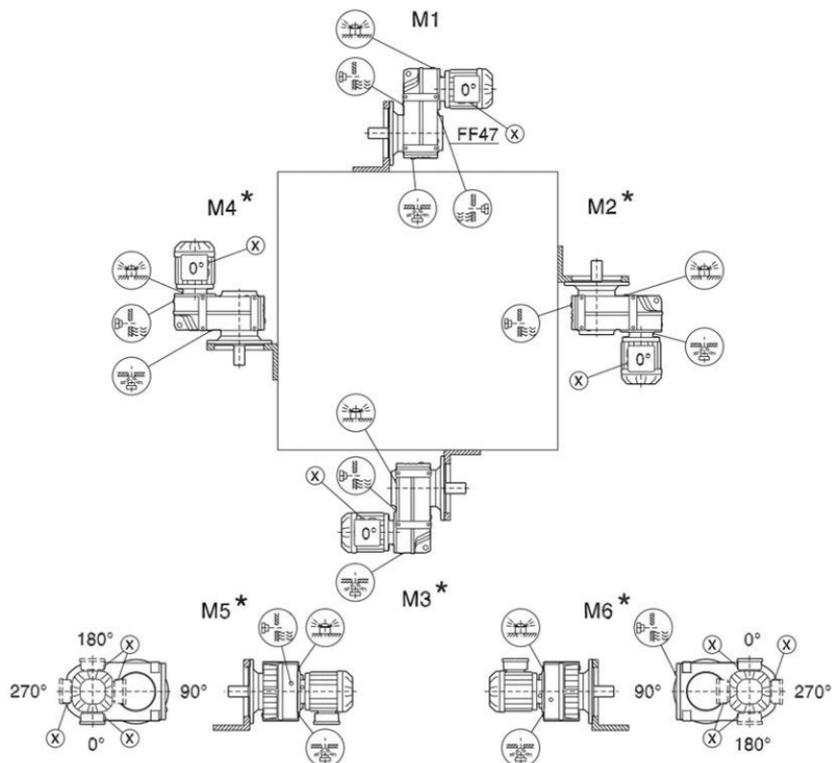
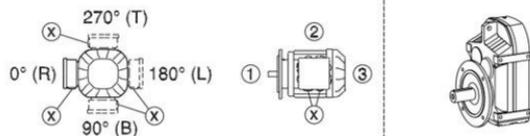
# RXF57~107



## 8.5 Mounting positions for F series parallel shaft helical gear motors F/FAB/FHB27~157, FVB27~107



# FF/FAF/FHF/FZ/FAZ/FHZ27~157, FVF/FVZ27~107

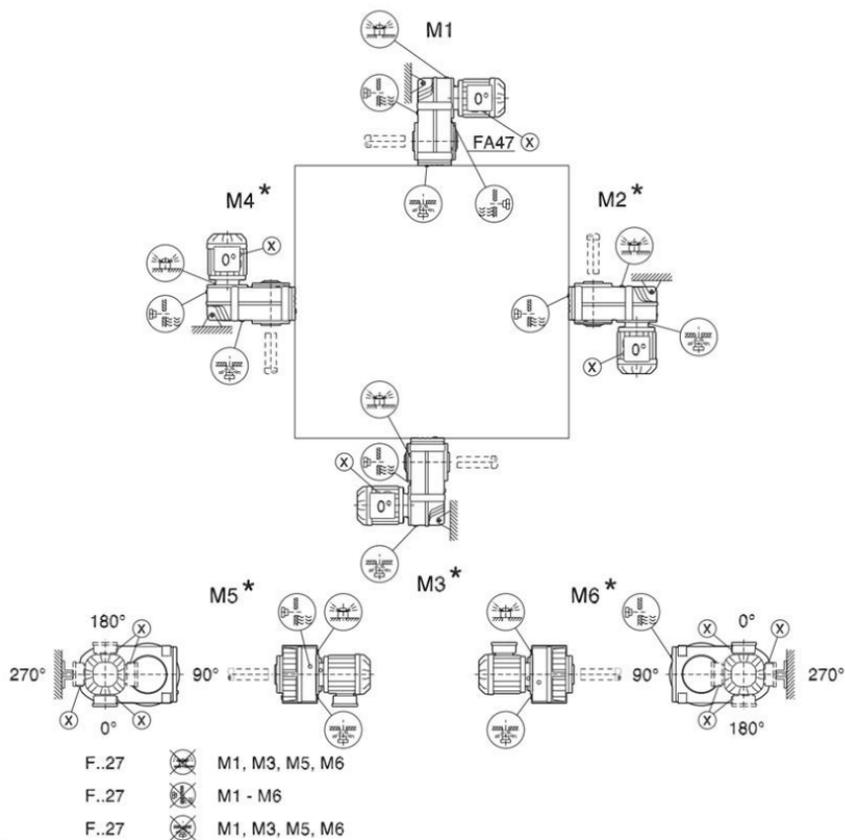
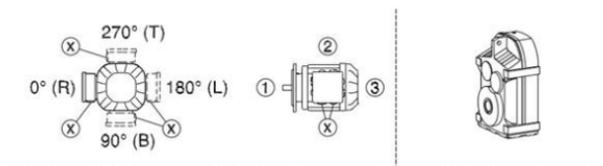


F..27 M1, M3, M5, M6

F..27 M1 - M6

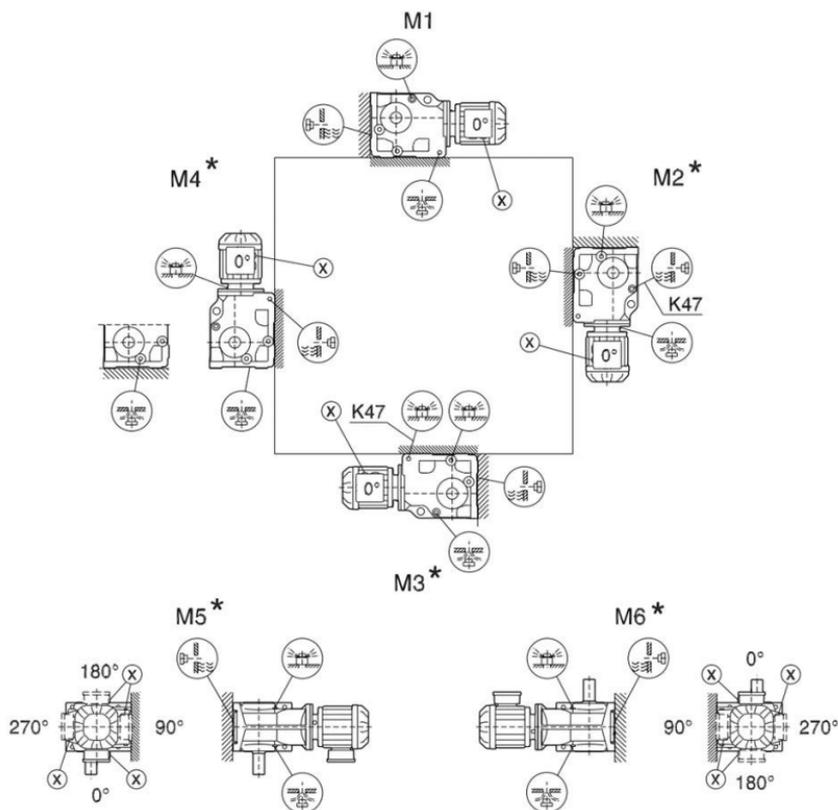
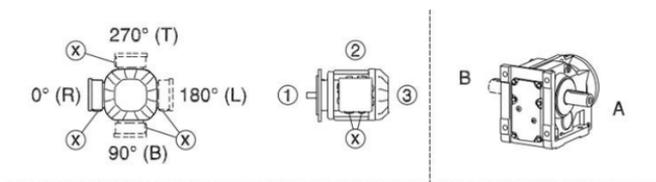
F..27 M1, M3, M5, M6

# FA/FH27~157, FV27~107

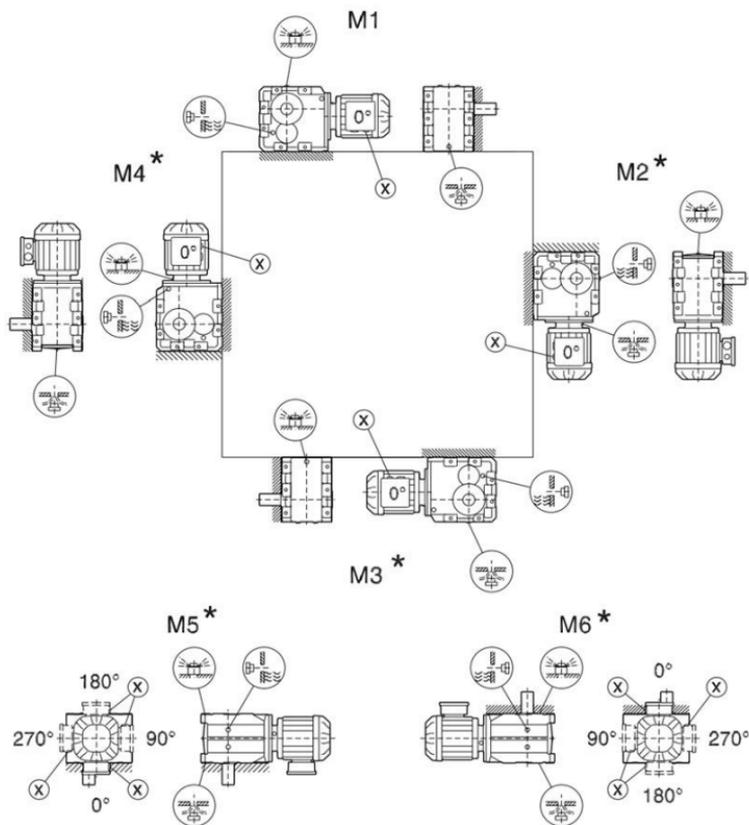
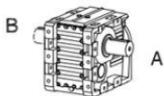
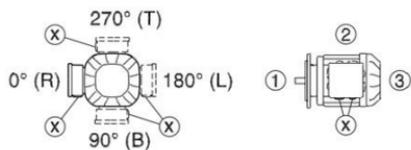


## 8.6 Mounting positions for K series bevel-helical gear motors

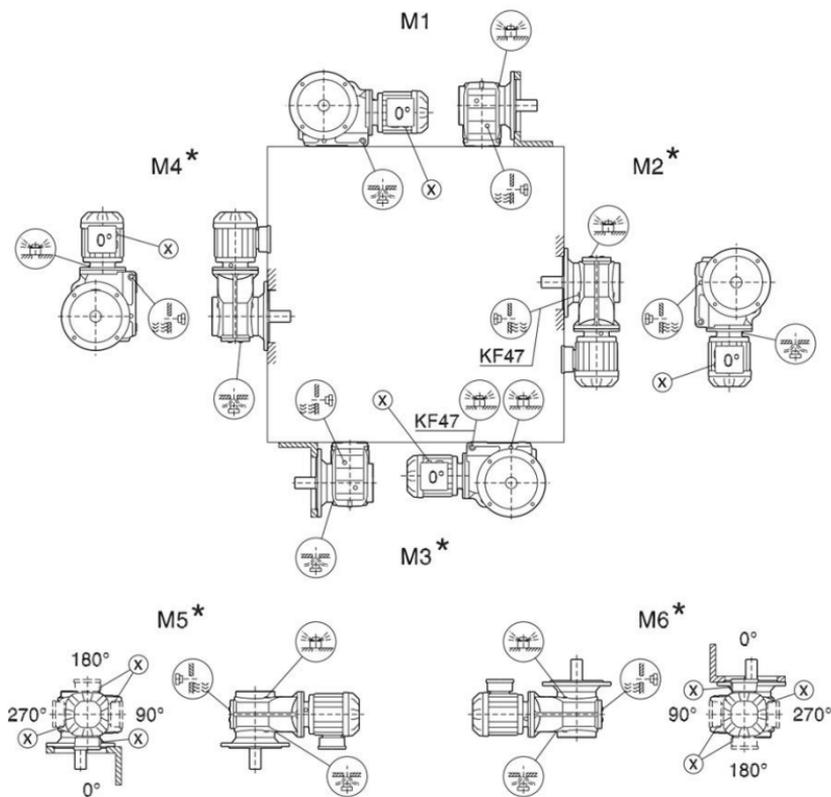
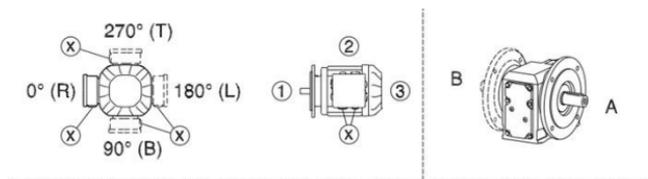
K37~157, KAB/KHB47~157, KVB47~107



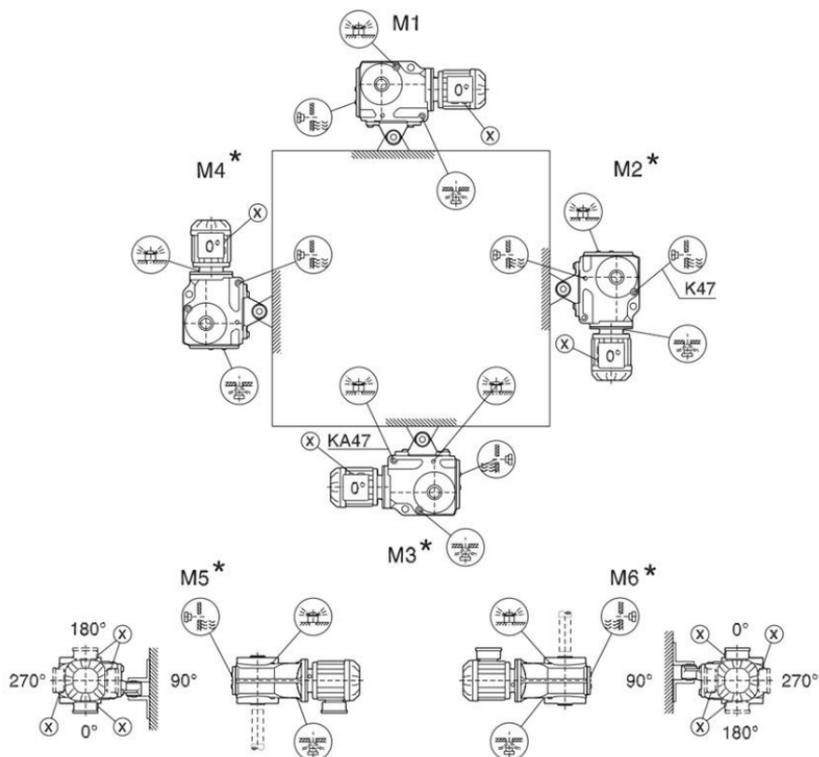
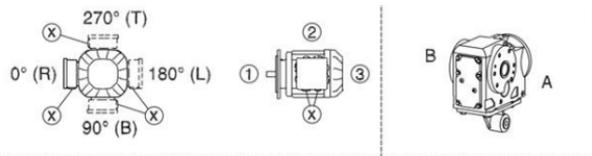
K167~187, KHB167~187



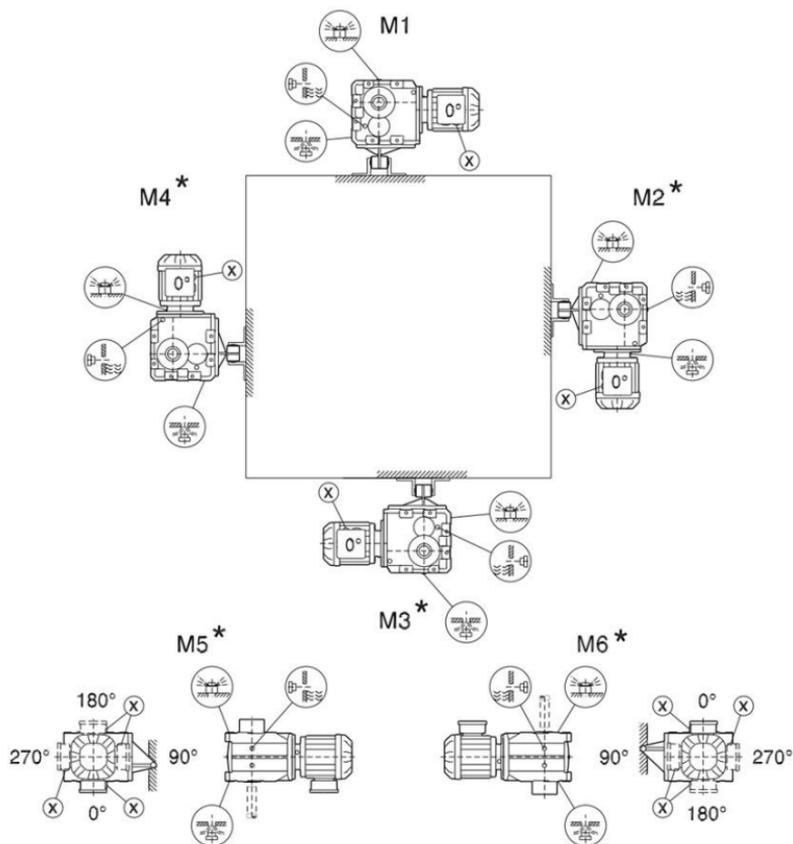
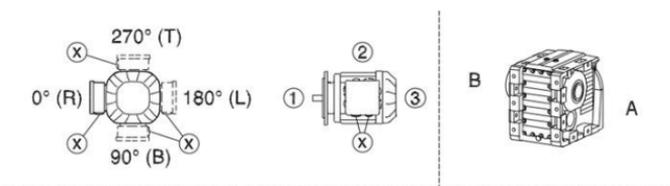
KF/KAF/KHF/KZ/KAZ/KHZ37~157, KVF/KVZ37~107



# KAT/KHT37~157, KVT37~107

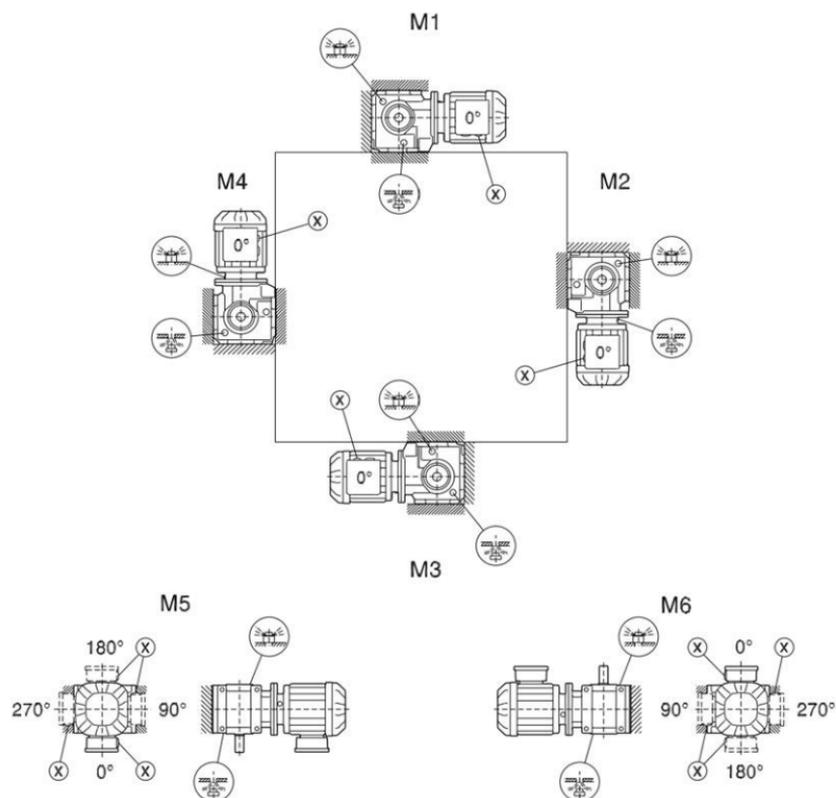
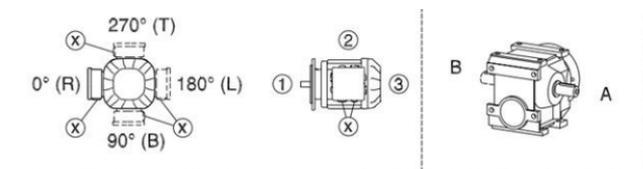


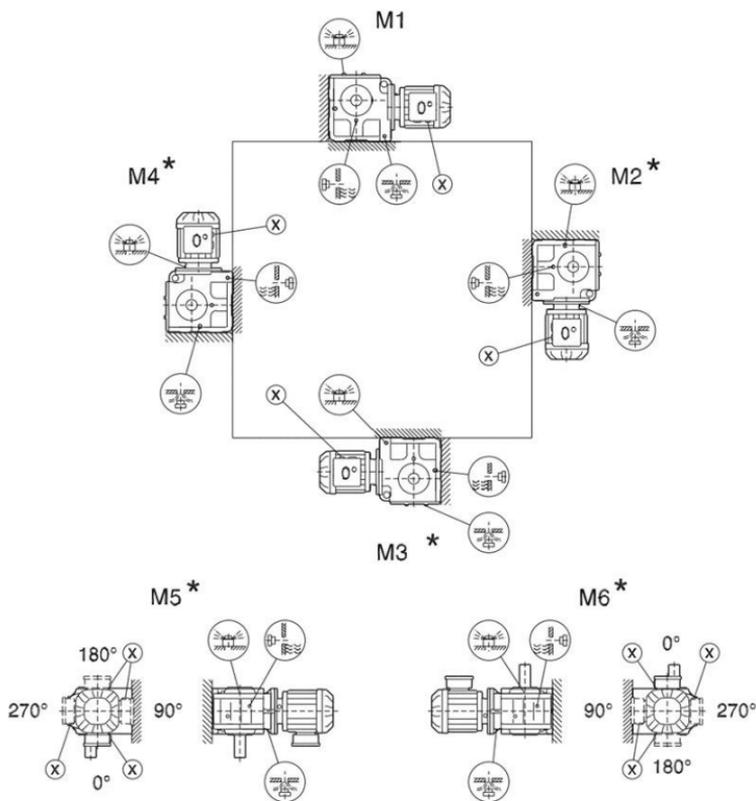
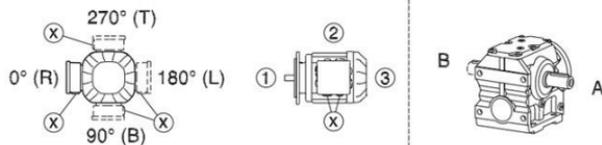
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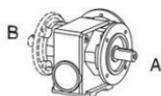
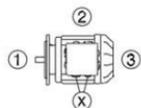
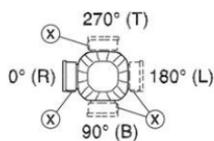
## 8.7 Mounting positions for S series helical-worm gear motors

S37

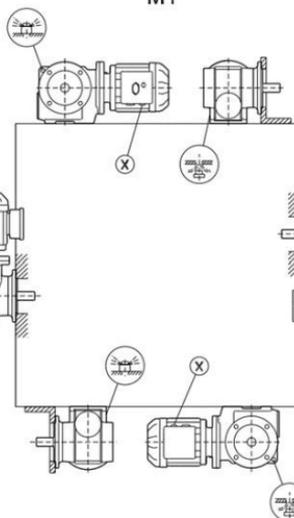




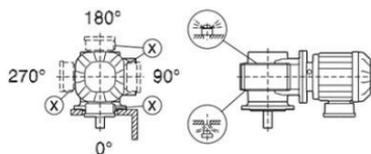
# SF/SAF/SHF37



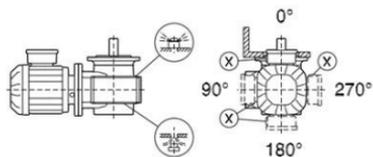
M1



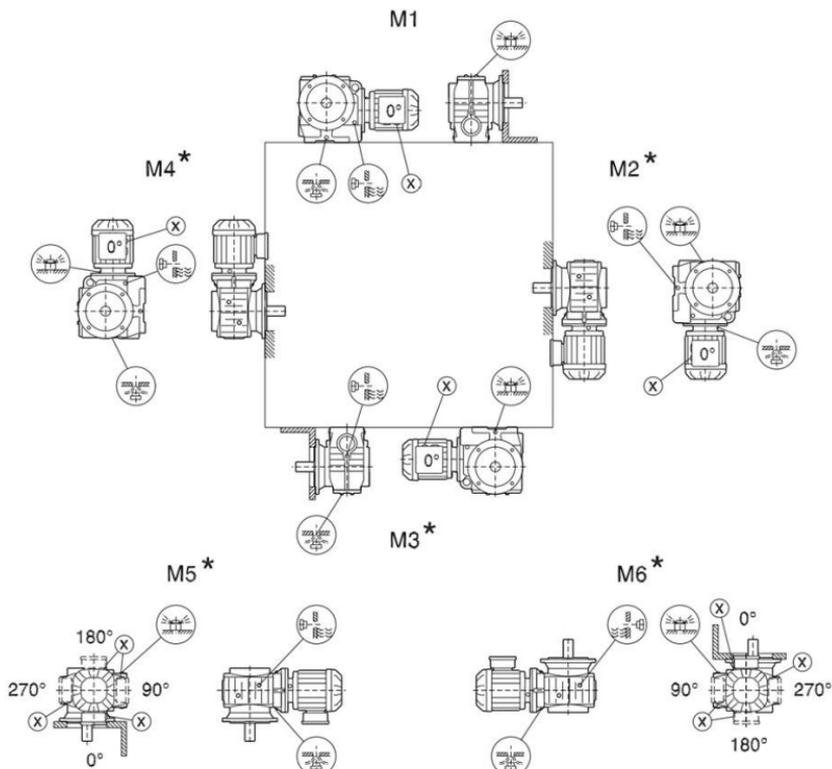
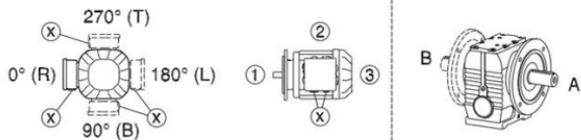
M5



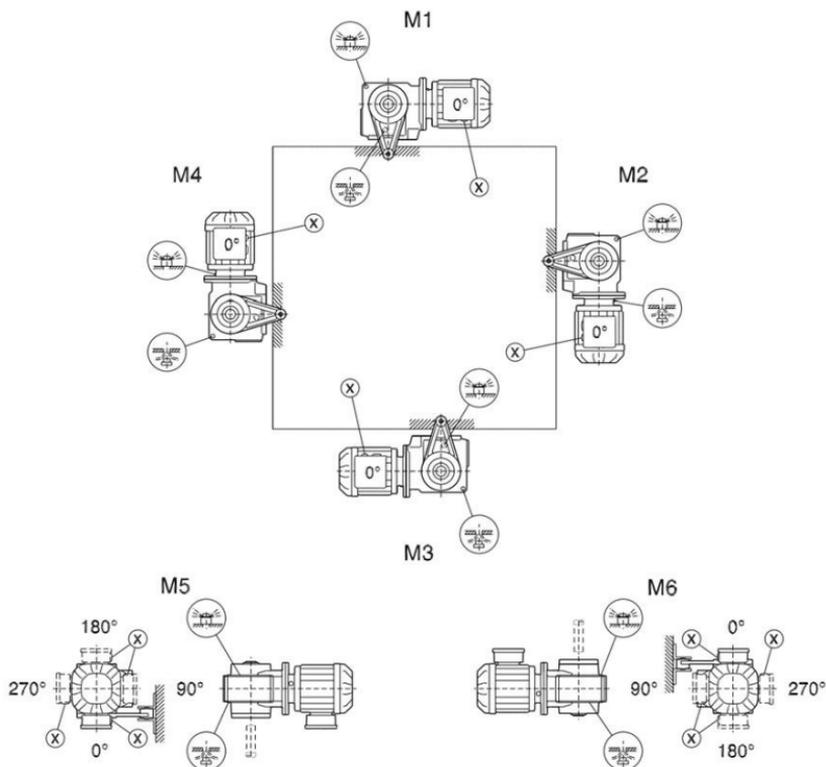
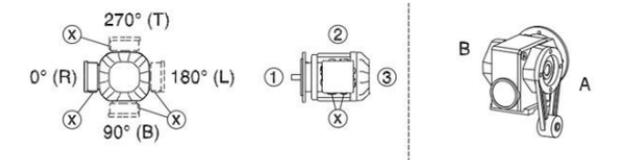
M6



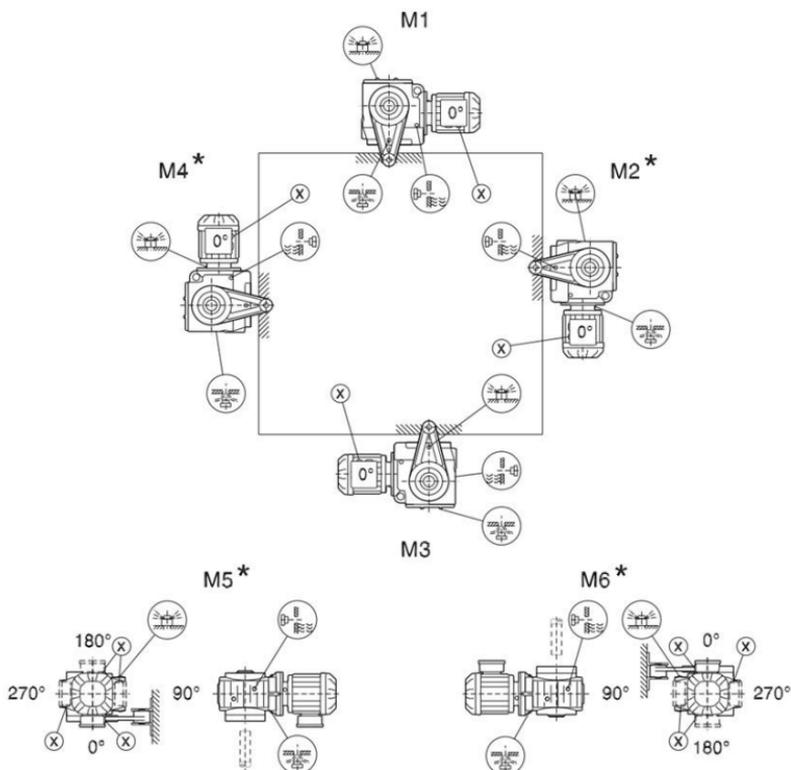
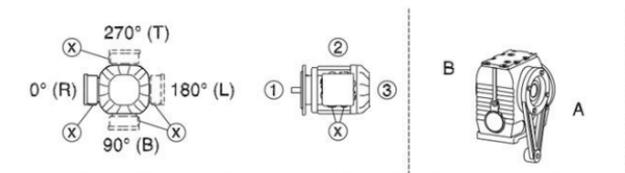
# SF/SAF/SHF/SAZ/SHZ47~97



# SAT/SHT37



# SAT/SHT47~97



## 9 Lubricants

### Brief Introduction

Unless a special arrangement is made, ONLY supplies the drives with a lubricant fill adapted for the specific gear unit and mounting position. The decisive factor is the mounting position (M1~M6, →"Mounting Positions and Important Order Information") specified when ordering the drive. You must adapt the lubricant fill to any subsequent changes made to the mounting position (→ Lubricant fill quantities).

### 9.1 Anti-friction bearing greases

The anti-friction bearings in gear units and motors are given a factory-fill with the greases listed below. ONLY recommends regreasing anti-friction bearings with a grease fill at the same time as changing the oil.

Ambient temperature	Grease brand	Type
-40°C~60°C	SINOPEC	7036 (460)
-40°C~80°C	Mobil	XHP 222

The following grease quantities are required:

- . For fast-running bearings (motor and gear unit input end): Fill the cavities between the rolling elements one-third full with grease.
- . For slow-running bearings (in gear units and at gear unit output end): Fill the cavities between the rolling elements two-thirds full with grease.

### 9.2 Lubricant for gear units

The lubricant table on the following page shows the permitted lubricants for ONLY gear units. Please note the following key to the lubricant table.

#### Key to the lubricant table

Abbreviations used, meaning of shading and notes:

CLP (CC)= Mineral oil

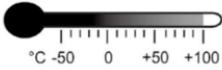
CLP PG = Polyethylene Glycol (PAG)

CLP HC = Synthetic hydrocarbons (PAO)

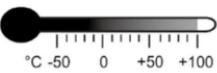
E = Ester oil

HCE = Synthetic hydrocarbons + ester oil

Lubricant table for R, F and K series gear units is as follows.

			ISO, NLGI						
-15	+40	CLP(CC)	VG 220	Mobilgear 600 XP 200	Shell Omala SG 220	Klüberoil GEM 1-220 N	Cater EP 220	BP Energol GR-XP 220	L-CKC220
-20	+30		VG 150	Mobilgear 600 XP 150	Shell Omala SG 150	Klüberoil GEM 1-150 N	Cater EP 150	BP Energol GR-XP 150	L-CKC150
-25	+80	CLP PG	VG 220	Mobil Glycoyle 220	Shell Omala S4 WE 220	Klübersynth GH 6-220	Cater SY 220	BP Enersyn SG-XP 220	
-25	+60	CLP HC	VG 220	Mobil SHC 630	Shell Omala S4 GX 220	Klübersynth GEM 4-220 N	Cater SH 220		L-CKT220
-30	+50		VG 150	Mobil SHC 629	Shell Omala S4 GX 150	Klübersynth GEM 4-150 N	Cater SH 150		L-CKT150
-35	+20		VG 68	Mobil SHC 626	Shell Omala S4 GX 68				
-40	0		VG 32	Mobil SHC 624			Dacnis SH 32		
-15	+40	HCE	VG 460		Shell Cassida Fluid GL460	Klüberoil 4UH1-460 N			
-20	+40	E	VG 320			Klüberbio EG2-320			

## Lubricant table for S series gear units is as follows.

		 DIN (ISO)	ISO,NLGI	 Mobil®	 Shell	 Klüber	 TOTAL	 bp	 SINOPEC
0	+40	CLP(CC)	VG 680	Mobilgear 600 XP 680	Shell Omala SG680	Klüberoil GEM 1-680N	Cater EP 680	BP Energol GR-XP 680	L-CKC680
-10	+40		VG460	Mobilgear 600 XP 460	Shell Omala SG460	Klüberoil GEM 1-460N	Cater EP 460	BP Energol GR-XP 460	L-CKC460
-20	+80	CLP PG	VG460			Klübersynth GH 6-460			
-25	+60		VG 220	Mobil Gly- goyle 220	Shell Tivela S4 WE 220	Klübersynth GH 6-220	Cater SY 220	BP Enersyn SG-XP 220	
-15	+60	CLP HC	VG460	Mobil SHC 634	Shell Omala S4 GX 460	Klübersynth GEM 4-460N	Cater SH 460		L-CKT460
-25	+40		VG 220	Mobil SHC 630	Shell Omala S4 GX 220	Klübersynth GEM 4-220N	Cater SH 220		L-CKT220
-30	+30		VG 150	Mobil SHC 629	Shell Omala S4 GX 150	Klübersynth GEM 4-150N	Cater SH 150		L-CKT150
-40	+20		VG68	Mobil SHC 626	Shell Omala S4 GX 68				
-15	+40	HCE	VG 460		Shell Cassida Fluid GL460	Klüberoil 4UH1-460N			
-20	+40	E	VG 320			Klüberbio EG2-320			

### 9.3 Lubricant fill quantities

The specified fill quantities are recommended 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 capacity.

The following tables show guide values for lubricant fill quantities in relation to the mounting position M1 ... M6.

#### R series helical gear units

R... / R..F..

Gear Unit Size	Oil quantity [L]					
	M1 <sup>1)</sup>	M2 <sup>1)</sup>	M3	M4	M5	M6
17	0.25	0.55	0.35	0.55	0.35	0.4
27	0.25/0.4	0.7	0.5	0.7	0.5	0.5
37	0.3/0.95	0.85	0.95	1.05	0.75	0.95
47	0.7/1.5	1.6	1.5	1.65	1.5	1.5
57	0.8/1.7	1.9	1.7	2.1	1.7	1.7
67	1.1/2.3	2.4	2.8	2.9	1.8	2
77	1.2/3	3.3	3.6	3.8	2.5	3.4
87	2.3/6	6.5/8.1	7.4	7.4	6.4	6.6
97	4.6/9.8	11	11.7	13.4	11.3	11.7
107	6/13.7	16.3	16.9	19.2	13.2	15.9
127	6.4/17	18.3	18.2	22	16.8	17.9
127T	7/18.7	20.1	20	24.2	18.5	19.7
137	10/25	28	29.5	31.5	25	25
147	15.4/40	46.5	48	52	39.5	41
167	27/70	82	78	88	66	69

1) With compound gear units, the larger gear unit must be filled with the larger oil quantity.

RF.. / RZ.. / RM..

Gear Unit Size	Oil quantity [L]					
	M1 <sup>1)</sup>	M2 <sup>1)</sup>	M3	M4	M5	M6
17	0.25	0.55	0.35	0.55	0.35	0.4
27	0.25/0.4	0.7	0.5	0.7	0.5	0.5
37	0.35/0.95	0.9	0.95	1.05	0.75	0.95
47	0.65/1.5	1.6	1.5	1.6	1.5	1.5
57	0.8/1.7	1.8	1.7	2	1.7	1.7
67	1.2/2.5	2.5/3.2	2.7	2.8	1.9	2.1
77	1.20/2.5	3.1/4	3.3	3.6	2.4	3
87	2.4/6	6.5/8.2	7.3	7.4	6.4	6.5
97	5.1/10.2	11.9	11.2	14	11.2	11.8
107	6.3/14.9	15.9	17	19.2	13.1	15.9
127	6.6/16	18.3	18.2	21.4	15.9	17
127T	7.3/17.6	20.1	20	23.5	17.5	18.7
137	9.5/25.0	27	29	32.5	25	25
147	16.4/42.0	47	48	52	42	42
167	26.0/70.0	82	78	88	65	71

1) With compound gear units, the larger gear unit must be filled with the larger oil quantity.

RX.. 系列

Gear Unit Size	Oil quantity [L]					
	M1	M2	M3	M4	M5	M6
57	0.6	0.8	1.3	1.3	0.9	0.9
67	0.8	0.8	1.7	1.4	1.1	1.1
77	1.1	1.5	2.6	2.7	1.6	1.6
87	1.7	2.5	4.8	4.8	2.9	2.9
97	2.1	3.4	7.4	7	4.8	4.8
107	3.9	5.6	11.6	11.9	7.7	7.7

RXF..

Gear Unit Size	Oil quantity [L]					
	M1	M2	M3	M4	M5	M6
57	0.5	0.8	1.1	1.1	0.7	0.7
67	0.7	0.8	1.5	1.4	1	1
77	0.9	1.3	2.4	2	1.6	1.6
87	1.6	1.95	4.9	3.95	2.9	2.9
97	2.1	3.7	7.1	6.3	4.8	4.8
107	3.1	5.7	11.2	9.3	7.2	7.2

### F series parallel-shaft helical gear units

F../FAB../FHB../FVB..:

Gear Unit Size	Oil quantity [L]					
	M1	M2	M3	M4	M5	M6
27	0.6	0.8	0.65	0.7	0.6	0.6
37	0.95	1.25	0.7	1.25	1	1.1
47	1.5	1.8	1.1	1.9	1.5	1.7
57	2.25	3.15	1.65	3.15	2.4	2.5
67	2.7	3.8	1.9	3.8	2.9	3.2
77	5.9	7.3	4.3	8	6	6.3
87	10.8	13	7.7	13.8	10.8	11
97	18.5	22.5	12.6	25.2	18.5	20
107	24.5	32	19.5	37.5	27	27
127	39.5	51.7	31.5	60.1	45.6	44.2
157	69	104	63	105	86	78

FF..:

Gear Unit Size	Oil quantity [L]					
	M1	M2	M3	M4	M5	M6
27	0.6	0.8	0.65	0.7	0.6	0.6
37	1	1.25	0.7	1.3	1	1.1
47	1.6	1.85	1.1	1.9	1.5	1.7
57	2.3	3.1	1.7	3.1	2.3	2.4
67	2.7	3.8	1.9	3.8	2.9	3.2
77	5.9	7.3	4.3	8.1	6	6.3
87	10.8	13.2	7.8	14.1	11	11.2
97	19	22.5	12.6	25.6	18.9	20.5
107	25.5	32	19.5	38.5	27.5	28
127	40.6	51	31.5	61.2	46.3	44.9
157	72	105	64	106	87	79

FA(H/V)..., FA(H/V)F.., FA(H/V)Z..:

Gear Unit Size	Oil quantity [L]					
	M1	M2	M3	M4	M5	M6
27	0.6	0.8	0.65	0.7	0.6	0.6
37	0.95	1.25	0.7	1.25	1	1.1
47	1.5	1.8	1.1	1.9	1.5	1.7
57	2.7	3.5	2.1	3.4	2.9	3
67	2.7	3.8	1.9	3.8	2.9	3.2
77	5.9	7.3	4.3	8	6	6.3
87	10.8	13	7.7	13.8	10.8	11
97	18.5	22.5	12.6	25.2	18.5	20
107	24.5	32	19.5	37.5	27	27
127	38.3	50.9	31.5	59.7	44.7	43.3
157	68	103	62	104	85	77

## K series helical-bevel gear units

K.. / KAB.. / KHB.. / KVB..:

Gear Unit Size	Oil quantity [L]					
	M1	M2	M3	M4	M5	M6
37	0.5	1	1	1.25	0.95	0.95
47	0.8	1.3	1.5	2	1.6	1.6
57	1.1	2.2	2.2	2.8	2.3	2.1
67	1.1	2.4	2.6	3.45	2.6	2.6
77	2.2	4.1	4.4	5.8	4.2	4.4
87	3.7	8	8.7	10.9	8	8
97	7	14	15.7	20	15.7	15.5
107	10	21	25.5	33.5	24	24
127	21	41.5	44	54	40	41
157	31	65	68	90	62	63
167	33	97	109	127	89	86
187	53	156	174	207	150	147

KF..:

Gear Unit Size	Oil quantity [L]					
	M1	M2	M3	M4	M5	M6
37	0.5	1.1	1.1	1.5	1	1
47	0.8	1.3	1.7	2.2	1.7	1.6
57	1.2	2.2	2.4	3.15	2.5	2.3
67	1.1	2.4	2.8	3.7	2.7	2.7
77	2.1	4.1	4.4	5.9	4.5	4.5
87	3.7	8.2	9	11.9	8.4	8.4
97	7	14.7	17.3	21.5	15.7	15.7
107	10	21.8	25.8	35.1	25.2	25.2
127	21	41.5	46	55	41	41
157	31	66	69	92	62	63

KA../KH../KV../ KA(H/V)F../KA(H/V)Z..

Gear Unit Size	Oil quantity [L]					
	M1	M2	M3	M4	M5	M6
37	0.5	1	1	1.4	1	1
47	0.8	1.3	1.6	2.15	1.6	1.6
57	1.2	2.2	2.4	3.15	2.7	2.4
67	1.1	2.4	2.7	3.7	2.6	2.6
77	2.1	4.1	4.6	5.9	4.4	4.4
87	3.7	8.2	8.8	11.1	9.2	8
97	7.0	14.7	15.7	20	14	15.7
107	10	20.5	24	32.4	26.5	24
127	21	41.5	43	52	42	40
157	31	65	68	90	62	63
167	33	97	109	127	89	86
187	53	156	174	207	150	147

### S series helical-worm gear units

S..:

Gear Unit Size	Oil quantity [L]					
	M1	M2	M3 <sup>1)</sup>	M4	M5	M6
37	0.25	0.4	0.5	0.55	0.4	0.4
47	0.35	0.8	0.7/0.9	1.03	0.8	0.8
57	0.5	1.2	1/1.2	1.43	1.3	1.3
67	1	2	2.2/3.1	3.1	2.6	2.6
77	1.9	4.2	3.7/5.4	5.9	4.4	4.4
87	3.3	8.1	6.9/10.4	11.3	8.4	8.4
97	6.8	15	13.4/18	21.8	17	17

1) With compound gear units, the larger gear unit must be filled with the larger oil quantity.

SF..:

Gear Unit Size	Oil quantity [L]					
	M1	M2	M3 <sup>1)</sup>	M4	M5	M6
37	0.25	0.4	0.5	0.55	0.6	0.4
47	0.4	0.9	0.9/1.05	1.08	1.13	1
57	0.5	1.2	1/1.5	1.48	1.53	1.4
67	1	2.2	2.3/3	3.2	3.5	2.7
77	1.9	4.1	3.9/5.8	6.5	7.2	4.9
87	3.8	8	7.1/10.1	12	13.2	9.1
97	7.4	15	13.8/18.8	23.1	25.2	18

1) With compound gear units, the larger gear unit must be filled with the larger oil quantity.

SA.. / SH.. / SAF.. / SHF.. / SAZ.. / SHZ..:

Gear Unit Size	Oil quantity [L]					
	M1	M2	M3 <sup>1)</sup>	M4	M5	M6
37	0.25	0.4	0.5	0.5	0.4	0.4
47	0.4	0.8	0.7/0.9	1.03	0.8	0.8
57	0.5	1.1	1/1.5	1.43	1.2	1.2
67	1	2	1.8/2.6	2.9	2.5	2.5
77	1.8	3.9	3.6/5	5.8	4.5	4.5
87	3.8	7.4	6/8.7	10.8	8	8
97	7	14	11.4/16	21	15.7	15.7

1) With compound gear units, the larger gear unit must be filled with the larger oil quantity.





## **宁波东力传动设备有限公司**

**NINGBO DONLY TRANSMISSION EQUIPMENT CO.,LTD.**

Add: No.1 Yin Hai Road, Jiangbei, Ningbo, China

Tel: +86-574-8839 8888

Fax: +86-574-8839-8999

C.S.HL: 400-168-6666

P.C.: 315033

Website: [Http://www.donly.com](http://www.donly.com)