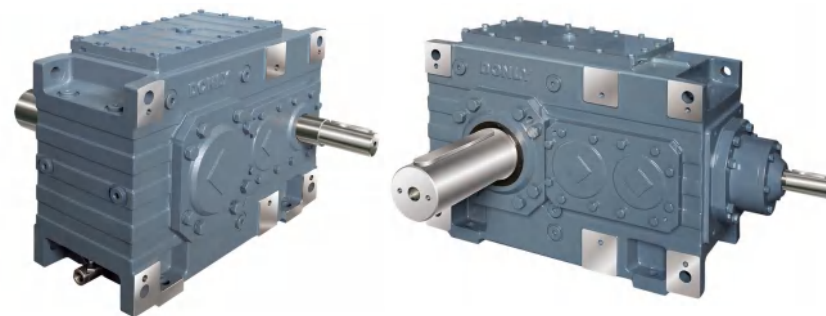


**DONLY 东力**

◆ 驱 动 无 限 可 能 ◆



Industrial Gear Units

**宁波东力传动设备有限公司**  
NINGBO DONLY TRANSMISSION EQUIPMENT CO.,LTD.

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Operating Instructions

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## 1、重要说明

### 安全和警告说明

请您务必注意这里所包含的安全和警告说明！



遵循《使用说明书》是保证正常运行、满足质量保证要求的前提条件。所以在使用传动装置进行工作之前，请您首先阅读本《使用说明书》！

《使用说明书》包含关于维护保养的重要说明；因此应该保存在设备附近垂手可得的地方。

如果构造型式与订购参数有所不同，请务必与 DONLY 公司进行联系！工业减速机在发货时没有加注机油。请注意铭牌上的规定！



请您注意“机械安装”和“投入运行”章节中的说明！废弃处理请遵守当地的有关规定：

- 箱体零件、齿轮、轴以及减速机滚动轴承应该作为钢铁废物处理。只要没有特别的收集措施，这个规定也适用于灰口铸铁制成的零件。
- 收集废油并且按照规定进行处理。



## 2 安全说明

下列安全说明主要涉及工业减速机的使用。如果使用其他系列减速机或者电机，您还要注意电机和减速机使用说明书中的安全说明。

该使用说明书各个章节中的补充安全说明您也必须加以注意。

在运行过程中以及在运行之后，工业减速机和电机有带电和运动的部件以及高温表面。只允许有资格的专业人员进行所有与运输、仓储、安装/ 装配、连接、运行、维护和维修有关的作业，且务必注意

- 有关的使用说明书和电路图
- 工业减速机上的警告和安全标志牌
- 与设备相关的特有规定和要求
- 国家/ 地方政府对安全和事故预防的有关规定



下列情况可能会导致严重的人身伤害和财产损失

- 不恰当的使用
- 错误的安装或者操作
- 未经允许擅自去除必要的防护外罩或者外壳。

工业减速机规定用于工业设备，符合现行标准和规定。您可在铭牌上和资料中查找技术数据以及关于允许使用条件的规定。

### 所有规定必须严格遵守！

收货后请立即检查是否有运输损坏。如有损坏请立即通知运输公司。出现这种情况后不得将设备投入运行。

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主电机。必须查明原因，有必要的应与 DONLY 公司联系。

请注意“检修和警告”章节中的说明。

下列情况可能会导致严重的人身伤害和财产损失

- 不恰当的使用
- 错误的安装或者操作
- 未经允许擅自去除必要的防护外罩或者外壳

## 2.1 工业减速机的运输

请您将起重吊耳旋入并拧紧。起重吊耳的设计承载能力仅为工业减速机通过电机适配器安装有电机时的重量；不得加载额外的负载。



· 仅允许借助起重钢索或者起重链通过主减速机起重吊耳起吊主减速机。您可从铭牌或者尺寸图上获得减速机的重量。原则上必须遵守所注明的负载和有关规定。

· 起重链或者起重钢索的长度必须设计合理，使得起重链或者起重钢索之间的夹角不超过 45°。

· 电机、辅助减速电机或者一级减速电机上安装的吊耳不得用来进行运输！

## 2.2 防腐蚀和仓储条件

工业减速机在发货时不加注机油。在下列概述中所规定的仓储时间条件下，请您注意所列出的防腐蚀条件：

仓储时间	仓储条件	
	室外要有防雨布	室内 空气干燥、温暖
6 个月	标准防护措施	标准防护措施

12 个月	与 DONLY 公司联系	标准防护措施
24 个月	长时间防护措施	与 DONLY 公司联系
36 个月	与 DONLY 公司联系	长时间防护措施
海运、海上仓储	与 DONLY 公司联系	长时间防护措施

## 标准防护措施

- 减速机在运输时固定在一个托盘上，并且没有防护盖板。
- 减速机内腔的防护措施：减速机应在使用防护油的条件下进行试运行。
- 使用轴承润滑脂保护油封和密封面。
- 没有油漆的表面，包括零备件在内，DONLY 公司均在出厂时使用防护涂层处理。在安装之前，或者安装到其它装置的装配面上之前，必须使用溶剂将防护涂层清理掉。
- 小型零备件和散装零件，例如螺钉、螺母等等，均包装在塑料防锈袋中发运。
- 螺纹孔和盲孔均使用塑料塞头封住。
- 防锈保护涂层不适合长时间仓储或者存放在潮湿的环境条件下。用户应负责使减速机处于不易生锈的状态下。
- 通气管塞已经在出厂时安装好。

## 长时间防护措施

- 减速机包装在一个适合海运的胶合板木箱中并且放在托盘上进行发运。减速机因此而受到防潮和防撞击保护。如果减速机被长时间存放或者必须采取措施以防止含有盐份的空气，DONLY 公司建议使用适合海运的包装方式。
- 除了标准防护措施之外，减速机内腔的其它防护措施：通过加油孔喷入形态为汽相（VPI = 汽相防锈剂）防锈剂的溶剂（参考值：每立方米 0.5 升 10% 的溶剂）。防锈剂为挥发性固体物质，喷入封闭的内

腔后，会以其蒸汽使周围空气饱和。当减速机内腔充满这样的气体时，会在减速机部件的表面上形成一层不可见的 VPI 膜，起到防锈的作用。在经过防锈处理之后，溶剂蒸汽（甲醇，乙醇）在封闭减速机之前应当挥发干净。通气管塞使用螺丝堵替换。在投入运行之前，必须将通气管塞重新旋入到减速机上。在 24 或者 36 个月之后重复进行长时间防护涂层处理（参见 防锈条件概述）。

· 没有油漆的表面，包括零备件在内，DONLY 公司均在出厂时使用防护涂层处理。在安装之前，或者安装到其它装置的装配面上之前，必须将防护涂层清理掉。

· 小型零备件和散装零件，例如螺钉、螺母等等，均包装在塑料防锈袋中发运。

· 螺纹孔和盲孔均使用塑料塞头封住。



· 在打开减速机时，严禁接触明火、火花和滚烫的物体。溶剂蒸汽可能会因此而点燃。

· 请您采取防护措施以防止操作人员受到溶剂蒸汽伤害，并且确保无论是在使用过程中还是在溶剂蒸汽挥发过程中务必避免接触明火。

### 3. 工业减速机的润滑

对于工业减速机，应根据构造型式采用“飞溅润滑”或者“油浴润滑”的润滑方式。

#### 飞溅润滑

飞溅润滑经常用于水平安装型式的工业减速机。在使用飞溅润滑时，机油油位较低。通过飞溅出来的机油对啮合部位和轴承进行润滑。

#### 油浴润滑

油浴润滑经常用于垂直和立轴构造型式的工业减速机。在使用油浴润滑时，机油油位必须足够高，使得啮合部位和轴承完全浸没在润滑剂中。

### 应用符号

下表显示的是本节插图中所使用的符号及其含义：

符号	含义
	通气管塞
	检查孔
	机油标尺
	放油塞
	注油塞
	油位观察窗
	排气螺栓

### 强制润滑

可以根据订单要求和结构型式采用强制润滑作为润滑方式。

在使用强制润滑时，机油油位较低。通过一台轴端泵或电机泵对没有浸没到油池中的啮合部位和轴承进行润滑。

使用“强制润滑”润滑方式的情况如下：

- 当立轴或者垂直安装型式的减速机不希望采用油浴润滑时
- 当输入转速非常高时
- 当必须通过一个外部油水冷却装置对减速机进行冷却时

## 4 机械安装

### 4.1 所需工具/ 辅助工具

以下工具不包括在供货范围内：

- 一套扳手
- 转矩扳手（用于收缩盘）
- 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
- 对于空心轴式减速机：
  - 螺杆、螺母、固定螺钉、压紧螺钉
  - 紧固部

### 装配误差

轴端	法兰
直径误差根据 ISO 标准. 对于 ≤ 50 mm 的实心轴, ISO k6 · 对于 > 50 mm 的实心轴, ISO m6 · 对于用于收缩盘的空心轴, ISO H7 · 对于带有键槽的空心轴, ISO H8	对中轴肩误差: · ISO js7/H8

### 4.2 在您开始之前

只有在下列情况下才能安装传动装置

- 当电机铭牌上的规定与电源一致时
- 当传动装置完好无损时（没有因为运输或者存放而导致的损坏）
- 当满足下列规定时：
  - 标准型减速机：

环境温度符合“润滑剂”章节中的润滑剂表格中的规定，没有油污、酸、煤气、蒸汽、射线等。

· 特种规格：

传动装置根据环境条件设计

### 4.3 准备工作

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（使用常用的溶剂）。

不得让溶剂进入到轴密封环的密封层上，否则会损坏材料！

### 4.4 减速机底座

采用底脚固定的减速机底座

快速而又可靠的减速机安装的前提条件是选择正确的底座类型以及制定全面的计划，该计划要包含恰当的带有所有必要的结构和尺寸标注的底座平面图。

为了防止有害的振动和晃动，在钢质支架上安装减速机时，请您特别要注意钢架应有足够的刚性。底座必须根据重量和转矩设计，要考虑作用于减速机上的作用力。

拧紧转矩

螺栓 / 螺母	螺栓 / 螺母拧紧转矩 [Nm]
M20	315
M24	540
M30	1090
M36	1900

## 4.5 实心轴式减速机安装

请您按照下列顺序进行安装：

1. 根据减速机示意图安装零部件。配合垫片可在安装结束后轻松进行调整，并且便于日后更换减速机。

2. 在选定的部位上借助三个相互间距尽可能大的底脚螺栓（两只螺栓在减速机一侧，一只螺栓在减速机另一侧），将减速机安装到支撑梁上。请您按照如下方式对减速机进行校准：

.借助底脚螺栓在垂直方向上升高、降低减速机或者使之倾斜

.向所需方向轻轻敲击底脚螺栓，将减速机调整到正确的水平方向

3. 在校准好减速机之后，请您将用来进行校准的底脚螺栓拧紧。将第四只底脚螺栓小心插入到支撑梁中并且将其拧紧。其间请您务必注意减速机的位置不得有变化。如果有必要的话请您重新校准减速机。

4. 首先将底脚螺栓的末端点焊到支撑梁上使之不能移动（每个底脚螺栓至少 3 个焊点）。

在进行点焊定位时，在两个方向上（从中线出发）交替将底脚螺栓相对于减速机中心线对称固定。这样就可避免点焊引起的失调。在所有螺栓均点焊定位之后，按照下列顺序进行最终的焊接。然后调整螺母，确保已经焊死的底脚螺栓不至于扭曲减速机箱体。

5. 在减速机固定螺钉的螺母被点焊定位之后，请您再次检查安装情况，接着将设备浇注。

6. 在二次浇注硬化之后，对安装情况进行最后检查，如果有必要的话就进行再次校准。

在安装之前，请根据减速机插图来检查底座尺寸。

### 校准时的安装精度

请您确保在校准时不要超过底座平面度安装误差（下列表格中的  $y_{\max}$  值）。您有可能需要使用配合垫片来校准底座底板上的减速机。

JE [mm]	$y_{\max}$ [mm]
< 400	0.035
400 ... 799	0.060
800 ... 1200	0.090
1200 ... 1600	0.125

## 4.6 采用键联结的空心轴式减速机的安装/ 拆卸

螺杆以及固定螺钉的螺纹和长度的选择取决于客户的环境结构。

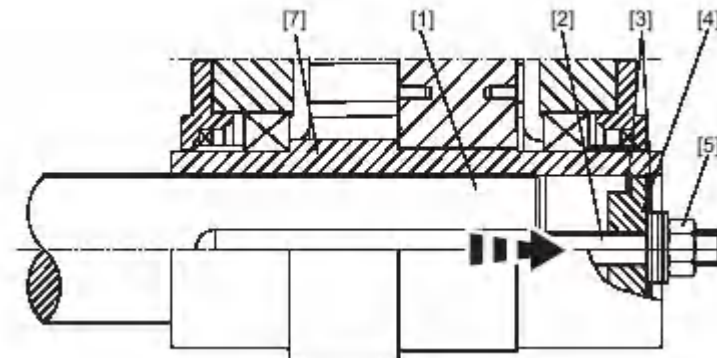


. 以下部件在供货范围内（参见图）：

. 卡环[3]，端板[4]

. 以下部件不在供货范围内（参见图）：

. 螺杆[2]、螺母[5]、固定螺钉[6]、压紧螺钉[8]



[1] 用户轴

[2] 螺杆

[3] 卡环

[4] 端板

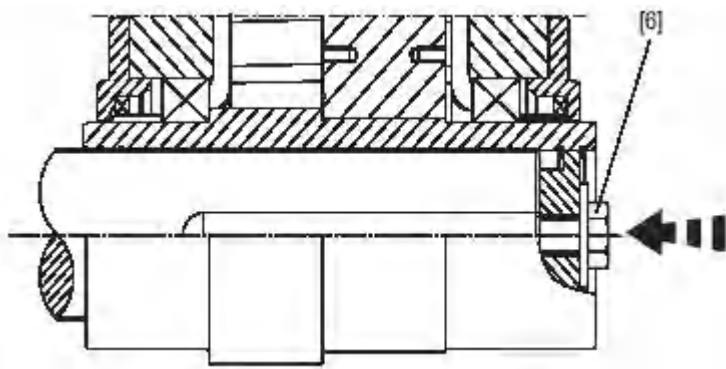
[5] 螺母

[7] 空心轴

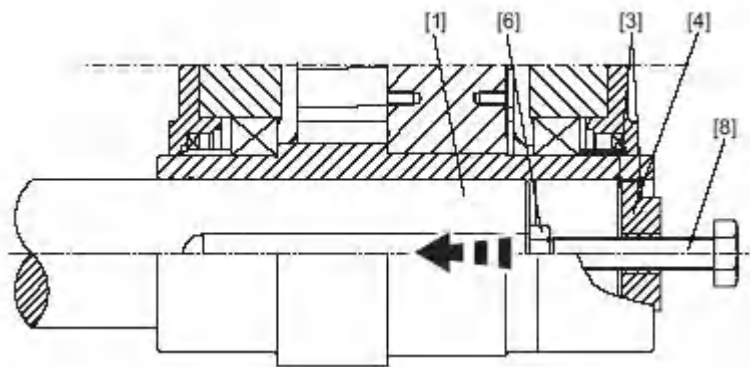
. 将用来安装和固定减速机的卡环[3]和端板[4] 安装在空心轴孔上。



- 将润滑脂涂抹到空心轴[7]和用户轴[1] 的轴端。
- 将减速机推向用户轴[1]。将螺杆[2]旋入用户轴[1]中。用螺母[5]拧紧用户轴[1]，直至用户轴[1] 的轴端和端板[4] 接触。
- 重新松开螺母[5] 并且旋出螺杆[2]。在安装之后使用固定螺钉[6] 锁紧用户轴[1]。



从用户轴上拆卸空心轴式减速机



- [1] 用户轴
- [3] 卡环

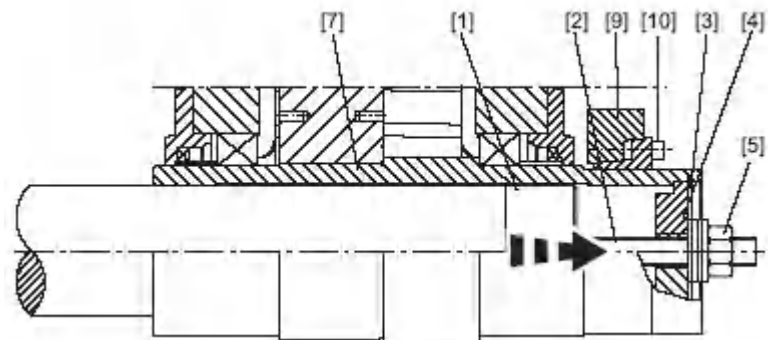
- [4] 端板
- [6] 固定螺钉
- [8] 压紧螺钉
- 旋出固定螺钉[6]。
- 拆下外侧卡环[3]，并且取下端板[4]。
- 将固定螺钉[6] 旋入用户轴[1] 中。
- 重新装入掉换的端板[4] 和外侧卡环[3]。
- 将压紧螺钉[8] 旋入端板[4]，将减速机从用户轴[1] 上拆卸下来。

#### 4.7 装配/ 拆卸带有收缩盘的空心轴式减速机



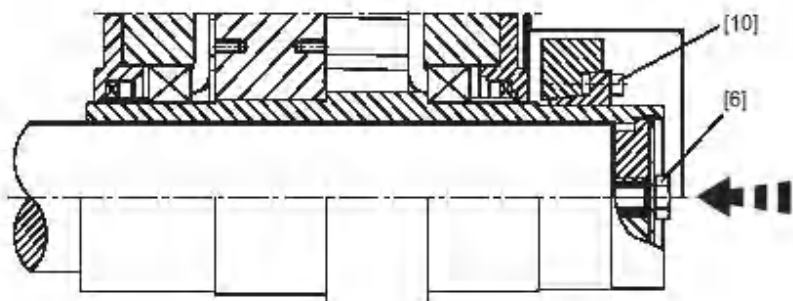
收缩盘用作减速机空心轴和用户轴之间的联接部件。您可从订货资料中获取所使用的收缩盘型号。

- 以下部件在供货范围内（参见图）：
    - 卡环[3]，端板 [4]
  - 以下部件不在供货范围内：
    - 螺杆[2]、螺母[5]、固定螺钉[6]、压紧螺钉[8]
- 螺杆以及固定螺钉的螺纹和长度的选择取决于客户的环境结构。  
将空心轴式减速机安装到用户轴上



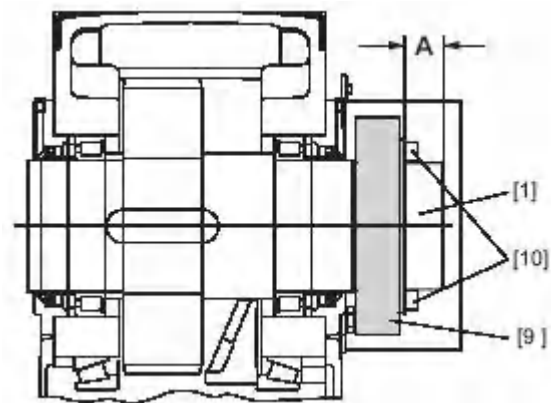
- [1] 用户轴
- [2] 螺杆
- [3] 卡环
- [4] 端板
- [5] 螺母
- [7] 空心轴
- [9] 收缩盘
- [10] 锁紧螺钉

- 在安装之前，请您去除空心轴和用户轴[1]上的油脂。
- 将用来安装和固定减速机的卡环[3]和端板[4] 安装在空心轴孔上。
- 将减速机推向用户轴[1]。将螺杆[2]旋入用户轴[1]中。用螺母[5]拧紧用户轴[1]，直至用户轴[1] 的轴端和端板[4] 接触。
- 重新松开螺母[5] 并且旋出螺杆[2]。在安装之后使用紧固螺钉[6] 锁紧用户轴[1]。



#### 收缩盘安装

- 用户轴[1] 没有安装时不要拧紧锁紧螺钉[10] — 空心轴可能会变形！
- 在空心轴的收缩盘[9] 安装位置上抹上少许润滑脂。
- 将收缩盘[9]推向空心轴孔的从动盘毂，不要用力。将用户轴[1]定位在空心轴孔中。然后将收缩盘[9] 从空心轴轴端移开。



- [1] 用户轴
- [9] 收缩盘
- [10] 锁紧螺钉

- 以顺时针方向（不是对面交叉）逐一将收缩盘[9]的锁紧螺钉[10]均匀拧紧。多次重复此过程，直至所有锁紧螺钉[10] 达到拧紧转矩。

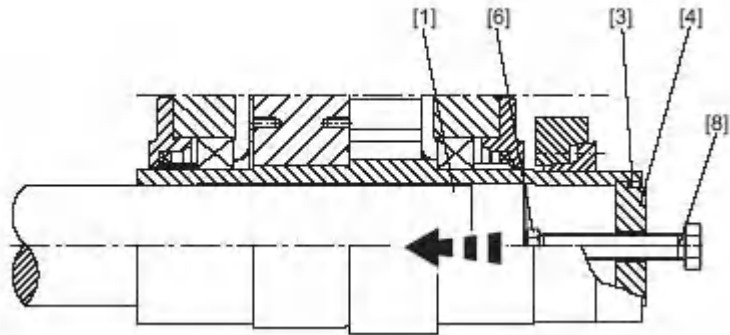
#### 收缩盘拆卸

- 以顺时针方向顺序均匀地松开锁紧螺钉，这样可避免端面倾斜。不要将锁紧螺钉全部旋出，否则收缩盘可能会弹出来。
- 如果环不能松开，就旋出压紧螺纹中现有的所有螺栓，并且将螺栓旋入压紧螺纹中，直至将多级锥形轴套从锥形环中压出。
- 将收缩盘从空心轴上拔出。



如果是其它设计规格的空心轴式减速机，请您在安装/拆卸时注意相关的资料！

从用户轴上拆卸空心轴式减速机



[1] 用户轴

[3] 卡环

[4] 端板

[6] 固定螺钉

[8] 压紧螺钉

- 旋出固定螺钉[6]。
- 拆下外侧卡环[3]，并且取下端板[4]。
- 将固定螺钉[6] 旋入用户轴[1] 中。
- 重新装入掉换的端板[4] 和外侧卡环[3]。
- 将压紧螺钉[8] 旋入端板[4]，将减速机从用户轴[1] 上拆卸下来。

## 5 机械安装选项

### 5.1 关于安装作业的重要说明



在对所有联轴器进行安装作业之前，请切断电机的电源并且采取措施防止意外重新接通！



重要安装说明 -15-

· 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。

· 联轴器、小齿轮等等绝对不能使用榔头敲击的方式套装到轴端部上（会损坏轴承、箱体和轴！）。

· 安装皮带轮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。



说明：

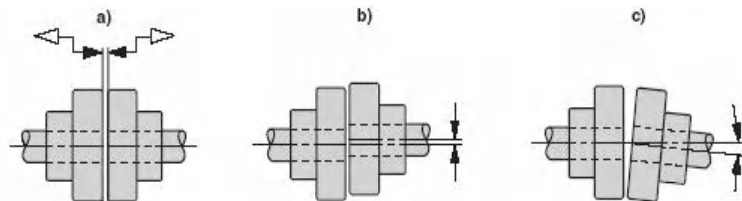
如果您事先使用润滑剂涂抹到输出部件上或者短时间加热（到 80-100° C），就可轻松地进行装配。

在装配联轴器时必须调整：

a) 轴向偏差（最大间距和最小间距）

b) 轴位移（同心性误差）

c) 角位移



输入和输出部件（如联轴器等）必须有接触保护盖板！

请注意：

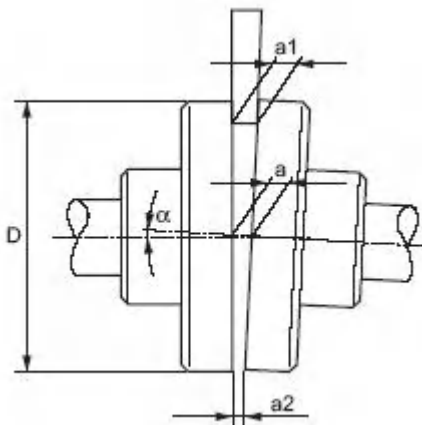
-16-

下列章节中列举的角位移和轴向偏差测量方法对于遵守“联轴器安

装”章节中规定的装配误差而言非常重要！

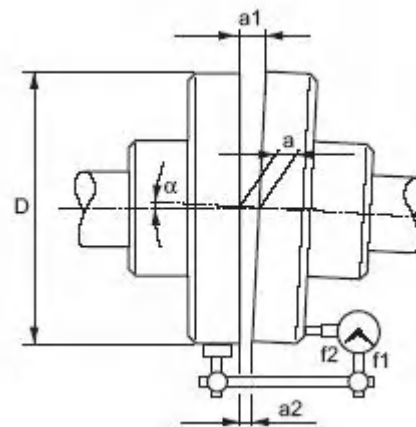
### 使用量规测量角位移

下列插图显示的是使用量规对角位移（ $a$ ）进行测量的方法。通过将两个联轴器的一半旋转  $180^\circ$  来消除联接端面偏差，接着计算出偏差平均值（ $a_1 - a_2$ ），只有这样，该测量方法才能得出精确的结果。



### 使用千分表测量角位移

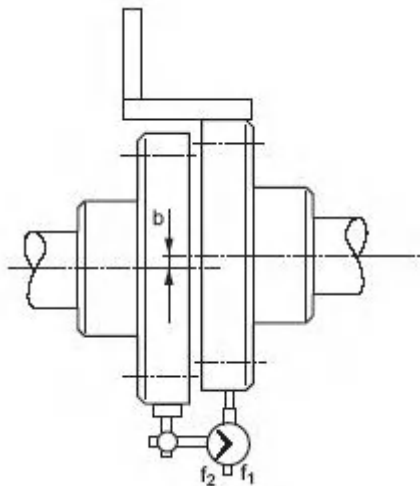
下列插图显示的是使用千分表对角位移进行测量的方法。将联轴器的一半（例如使用一个联接螺栓）共同旋转，使得千分表的测针在测量面上不再显著摆动，在这种情况下该测量方法所得出的结果与“使用量规测量角位移”章节中的结果相同。



使用该测量方法的前提条件是轴承在轴旋转过程中没有轴向间隙。如果这个条件不能满足，就必须消除两个联轴器一半的端面之间的轴向间隙。在联轴器的对面一侧也可以选择使用两个千分表（用来在旋转联轴器时计算千分表的偏差）。

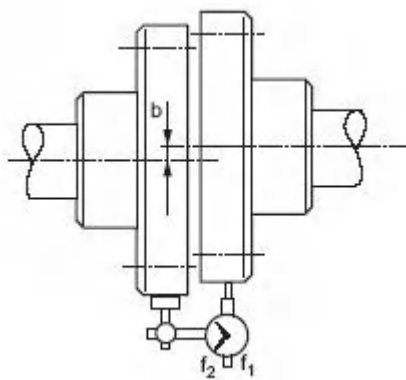
### 使用矫直尺和千分表测量轴位移

下列插图显示的是使用一根矫直尺来测量轴位移的方法。轴位移的允许值通常应小到可以使用千分表进行测量。将联轴器的一半与千分表共同旋转，并且将尺寸偏差二等分，这样根据在千分表上显示的偏差就可得出位移（尺寸“ $b$ ”），该位移中包含另一半联轴器的轴位移。



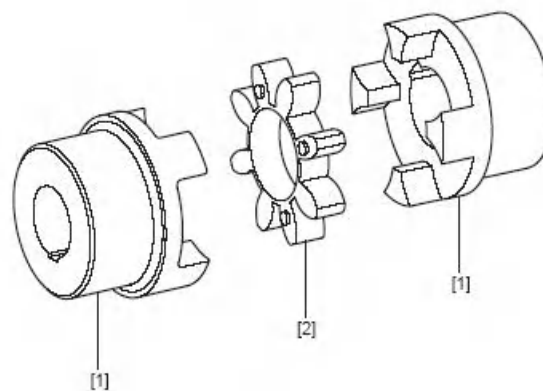
### 仅使用千分表来测量轴位移

下列插图显示的是使用一个比较精确的测量方法来对轴位移进行测量。将两个联轴器半体共同旋转，直到千分表的测针不能在测量面上滑动。将千分表上所显示的偏差二等分，就得出轴位移（尺寸“b”）。



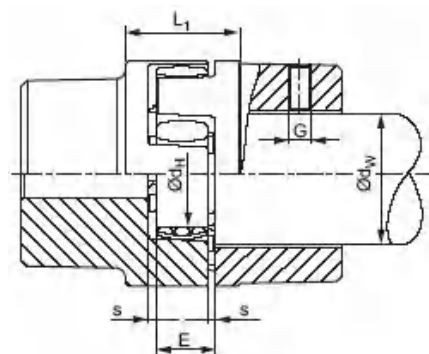
## 5.2 联轴器的装配

### 梅花联轴器



[1] 联轴器从动盘毂 [2] 齿环

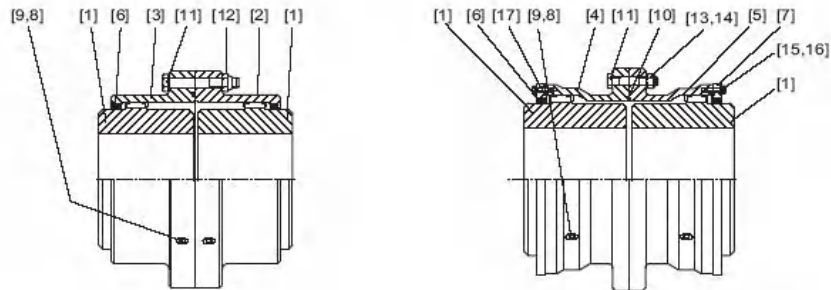
梅花联轴器不仅可以调整径向位移，也可以调整角位移。对轴进行谨慎精确的校准可以确保联轴器有较长的寿命。



将联轴器半体安装到轴上

为了保证联轴器的轴向间隙，请您注意准确地遵守轴距（尺寸E）。

## 安装难以转动的齿式联轴器



[1] 联轴器从动盘毂

[2] 轴套

[3] 轴套

[4] 轴套的一半

[5] 轴套的一半

[6] 密封环或者 O 形圈

[7] 外盖

[8] 润滑堵头

[9] 润滑孔

[10] 密封圈

[11] 螺栓

[12] 自锁螺母

[13] 止动垫片

[14] 螺母

[15] 螺栓

[16] 止动垫片

[17] O 形圈

· 在进行安装之前请您彻底清洁联轴器的每一个零部件，特别是啮合部位。

· 给 O 形圈[6] 抹少许润滑脂，并且将其插入到轴套的槽[2、3] 中。

· 给轴套[2、3] 啮合部位抹润滑脂并且将轴套插入轴端，不要伤及 O 形圈[6]。

· 将联轴器从动盘毂[1] 安装到轴上。从动盘毂末端必须与轴环密闭。

· 校准将要联接的机器并且检查轴距。

· 校准两个轴并且使用千分表检查允许值。装配误差取决于联轴器转速。

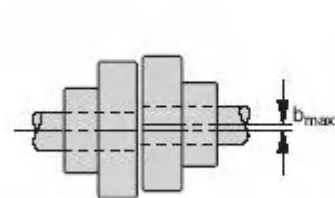
· 在您将轴套[2、3]旋入之前，对联轴器从动盘毂[1]进行冷却并且在啮合部位抹上润滑脂。

· 放入密封环[10] 并且使用规定的拧紧转矩将轴套的一半旋紧。为了便于安装您可以在密封环上抹上少许润滑脂。

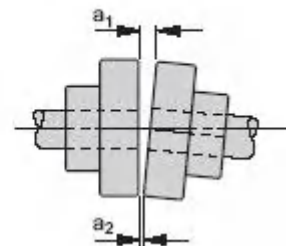
· 请您注意，两个轴套一半[4、5] 上的润滑孔[9] 在旋入之后相互之间呈 90° 位置。

装配误差

轴位移



角位移



## 5.3 逆止器

逆止器用来避免逆向转动。这样在运行过程中就只有固定的转向了。

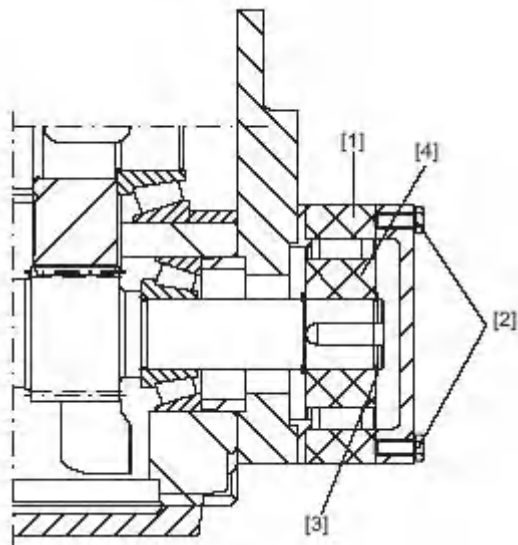


· 在逆止方向上不允许电机起动 — 请您在连接电机电源时注意正确的相位！在逆止方向上运行会导致逆止器损坏！

· 如果逆止方向有所改变，请务必与 DONLY 公司联系！

逆止方向变更

将内圈与锁紧件旋转 180° 就可改变逆止方向。为此必须使用拉拔器（不包括在供货范围中）将内圈与锁紧件拉出并且旋转 180° 后重新装入。



- [1] 外圈            [2] 锁紧螺钉
- [3] 卡环            [4] 带有隔离罩和锁紧件的内圈

- 松开逆止器的固定螺钉[2]。
- 取出外圈[1]。为了便于拆卸您可以沿着自由转动方向将外圈[2] 轻轻旋转。
- 取出卡环[3] 和带有隔离罩和锁紧件[4] 的内圈。
- 将内圈[4]与锁紧件旋转 180° 并且以相反顺序重新安装零部件。安装时的作用力只可作用在内圈[4]上并且不得传导给隔离罩与锁紧件。在进行安装时请您使用内圈[4]上的螺纹孔。
- 使用卡环[3]在轴向方向上卡紧内圈[4]。使用固定螺钉[2]重新安装外圈[1]。请您注意下列表格中列出的拧紧转矩：

螺栓尺寸	拧紧转矩[Nm]
M5	6
M6	10
M8	25
M10	48
M12	84
M16	206
M20	402
M24	696
M30	1420

- 修改减速机箱体上的转向标识。
- 在安装结束之后，检查逆止器运转是否平稳。

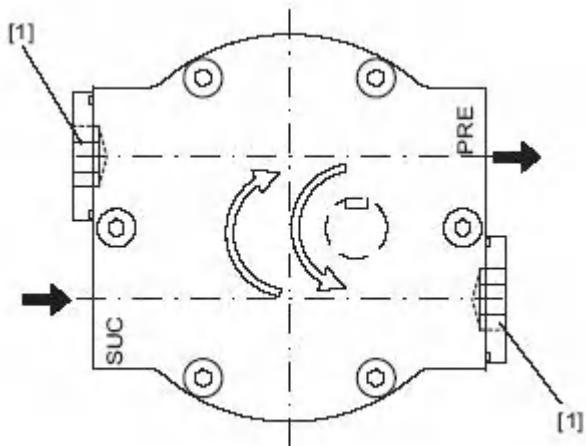
### 5.4 轴端泵

对于某些规格减速机，免维护的轴端泵可以用来给没有浸没到油池中的减速机零件进行润滑。轴端泵可以在两个转向上进行工作。

#### 泵的抽吸

抽吸管和压送管的连接与轴的转向无关并且不得加以改变。如果在减速机起动之后的 10 秒种内轴端泵还没有形成压力（参见“借助减速机上的油位观察窗监测流动情况”），

请您按照下列步骤处理：



[1] 插塞连接器

[SUC]抽吸管

[PRE]压送管

· 松开阀箱上抽吸管旁的插塞连接器[1]。使用润滑油注满抽吸管[SUC]和泵。

· 转动泵，使得减速机泵被机油润滑。

· 要保证泵在抽吸管[SUC] 中形成负压以便抽吸润滑油。

· **请您注意，减速机在开始时就必须得到充分润滑！**

· **不得改变管路的尺寸与直径！**

· **不要打开压送管[PRE]！**

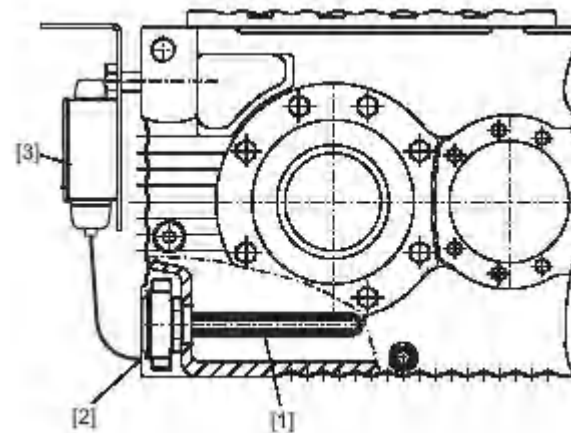
## 5.5 机油加热装置

当环境温度较低的情况下起动时（例如减速机冷起动），就必须加热机油以保证正常润滑。

接通和关闭特性机油加热装置

· 在达到出厂设定的温度时被接通。

· 在高出设定温度 8 ~ 10 ° C 时被关闭



[1] 机油加热装置

[2] 温度传感器

[3] 恒温器

在运行机油加热装置之前请您务必检查：

· 根据环境条件所做的电气连接是否正确（参见“电气连接”部分）

· 减速机的机油种类和油量是否正确（参见铭牌）

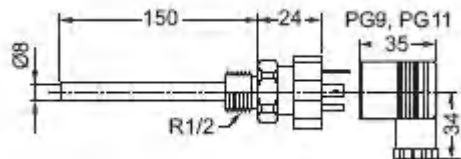
当连接错误或者在高于油位的情况下进行机油加热时，存在发生爆炸的危险！



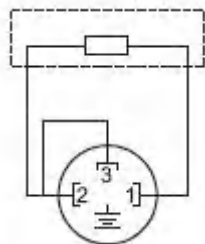
## 5.6 温度传感器 PT100

可以使用温度传感器 PT100 来测量减速机机油温度。

尺寸图

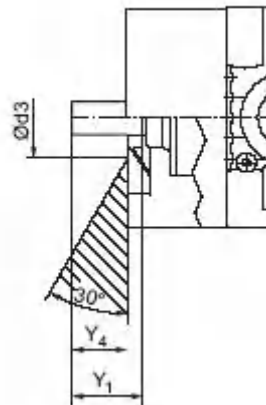


电气连接



## 5.7 散热风扇

如果超过了减速机的设计热功率，就可以安装散热风扇。如果在减速机投入运行之后环境条件有所变化，可以加装一个散热风扇。减速机的转向对散热风扇的运行没有影响。



进气口（阴影区域）务必保持畅通！

## 5.8 油水冷却装置的连接



在连接油水冷却装置时，请遵循制造商的技术资料。

## 5.9 电机泵的连接



在连接电机泵时，请遵循制造商的技术资料。

## 6 试运行

### 6.1 工业减速机的试运行



- 请您务必注意“安装说明”章节中的安装说明。
- 在对减速机进行维修操作时务必避免明火或者火花！
- 请您采取防护措施以保护人员不受汽相防锈剂的溶剂蒸汽伤害！

蒸汽伤害！

- 在投入运行之前请您务必检查油位是否正确！润滑剂加注量可以在铭牌中找到。
- 对于使用长效防锈剂处理过的减速机，您可通过通气管塞来更换减速机标识部位上的螺丝堵头。

在投入运行之前。

对于使用长效防锈剂处理过的减速机：从海运保护木箱中取出减速机。

- 去除减速机零部件上的防锈剂。请您注意，密封圈、密封面和密封唇会因机械摩擦而受到损坏。
- 在加注正确的机油种类和油量之前，请从减速机中去除残留的防护油。为此您可旋出放油塞，并且将残余的防护油排空。然后重新装上放油塞。
- 拆下注油塞。在加油时使用加油过滤器。使用正确的机油种类和加油量给减速机加注机油（参见铭牌）。减速机铭牌上规定的加油量为参考值。正确的加油量主要由油量标尺上的刻度决定。使用油量标尺检查油位是否正确。加油结束之后重新装上注油塞。
- 确定旋转的轴和联轴器均配备有合适的防护罩。
- 对于带有电机泵的减速机，请您检查强制润滑系统的功能是否正常。检查监测仪器是否正确连接。
- 在经过较长时间的存放之后（最多约 2 年），将减速机正确加油（参见铭牌），在无负荷状态下让减速机运转。这样就可确保润滑系统特

别是机油泵正常运行。

- 对于输出轴上安装有散热风扇的减速机，请检查规定角度范围内进气是否顺畅。
- 对于带有油位观察窗（备选装置）的减速机，您可通过目测方式检查油位是否正确（=机油在油位观察窗中可见）。

### 磨合期

作为试运行的第一个阶段，DONLY 公司建议磨合运行减速机。分 2 ~ 3 个阶段提高负荷和圆周速度，直至到最大值。该磨合过程大约要持续 10 小时。

在磨合阶段请您注意以下几点：

- 在起动时应检查铭牌上规定的性能，因为其频率和电压高度对于减速机寿命而言具有举足轻重的意义。
- 减速机运转是否均匀？
- 是否有振动或者异常运转噪声出现？
- 减速机上是否出现泄漏现象（润滑系统）？

### 6.2 带有逆止器的减速机投入运行



对于带有逆止器的减速机，请您注意电机的转向是否正确！

### 6.3 使减速机停止运转



**切断传动装置的电源，确保不会被意外接通！**

如果减速机长时间停止不用，您必须每隔 2 ~ 3 周让减速机运转一次。

如果减速机停止使用的时间超过 6 个月，就需要额外采取防锈措施：

- 对于使用飞溅润滑和油浴润滑法的减速机的内部防锈措施：
  - 使用铭牌上规定的机油种类将减速机加满油直至通气管塞处。
  - 强制润滑法减速机的内部防锈措施：
  - 此种情况下请与 DONLY 公司进行联系！
  - 外部防锈措施：
  - 使用蜡质防锈涂层对轴端和未经油漆的表面进行外部防锈处理。使用润滑脂涂抹在轴密封环的密封唇上以防止防锈剂渗入。
- 其它信息以及故障排除措施，请参见“运行故障”章节。



当重新投入运行时，请您注意“投入运行”章节中的说明。

时间间隔	必须做什么？
<ul style="list-style-type: none"> <li>· 日常工作</li> </ul>	<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>· 检查减速机噪声</li> <li>· 检查减速机是否有泄漏现象</li> </ul>
<ul style="list-style-type: none"> <li>· 在机器运行 500 ~ 800 小时后</li> </ul>	<ul style="list-style-type: none"> <li>· 首次投入运行后的第一次机油更换</li> </ul>
<ul style="list-style-type: none"> <li>· 在机器运行 500 小时之后</li> </ul>	<ul style="list-style-type: none"> <li>· 检查油位，有可能要加注机油（参见铭牌）</li> </ul>
<ul style="list-style-type: none"> <li>· 每隔 3000 小时运行，至少半年一次</li> </ul>	<ul style="list-style-type: none"> <li>· 检查机油如果减速机被用于室外或者潮湿的环境中，就要检查机油中的含水量。含水量不得超过 0.05%（500 ppm）。</li> <li>· 给密封环的迷宫式润滑装置加满密封油脂，每个润滑嘴使用大约 30 克密封油脂。</li> <li>· 清洁通气管塞</li> </ul>
<ul style="list-style-type: none"> <li>· 根据工作条件而定，至少每隔 12 个月</li> </ul>	<ul style="list-style-type: none"> <li>· 更换矿物机油（参见“减速机检修/维护工作”章节）</li> <li>· 检查固定螺钉是否安装紧密</li> <li>· 检查污染情况和油气冷却装置的状态</li> <li>· 检查油水冷却装置的状态</li> <li>· 清洁机油过滤器，有可能要更换滤芯</li> </ul>
<ul style="list-style-type: none"> <li>· 根据工作条件而定，至少每隔 3 个月</li> </ul>	<ul style="list-style-type: none"> <li>· 更换合成机油（参见“减速机检修/维护工作”章节）</li> </ul>
<ul style="list-style-type: none"> <li>· 不同（取决于外部影响因素）</li> </ul>	<ul style="list-style-type: none"> <li>· 改善或者更换表面防护漆/防锈漆</li> <li>· 清洁减速机箱体的外侧和散热风扇</li> <li>· 检查机油加热装置：                             <ul style="list-style-type: none"> <li>• 所有连接导线和接线端子是否连接牢固并且没有氧化？</li> <li>• 清洁结有结壳的元件（如加热棒），有可能需要更换（参见“减速机检修/维护工作”章节）</li> </ul> </li> </ul>

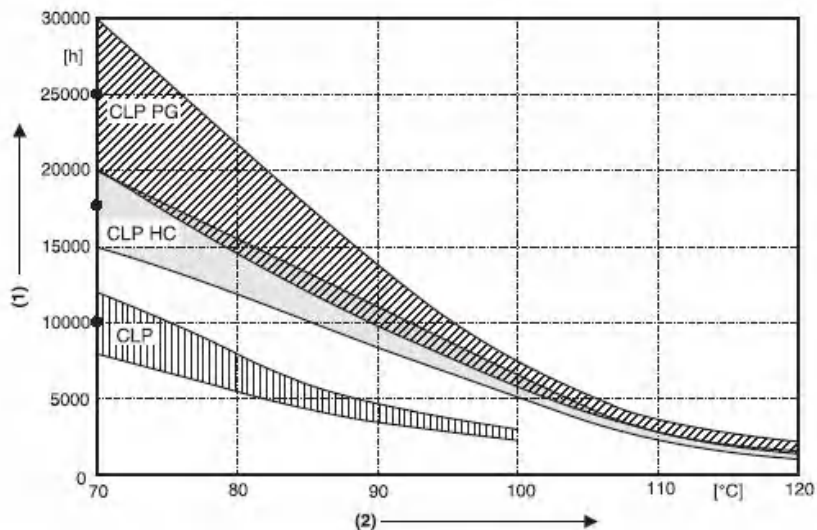
## 7 检修和维护

### 7.1 检修和维护间隔时间 -31-

### 7.2 润滑剂更换间隔时间

对于恶劣环境条件下使用的特殊规格，需要经常更换机油。-32-

使用矿物润滑剂 CLP 和 PAO 机油基（聚烯烃基）的合成润滑剂进行润滑。下列图中的合成润滑剂 CLP HC 即为 PAO 机油。



正常环境条件下的减速机润滑剂更换时间间隔

(1) 运行小时

(2) 油池持续温度

· 每种机油类型的平均值为 70 ° C

使用!

· 您可从示意图中了解到各种构造型式减速机的油位螺钉和放油塞以及通气管塞和油位观察窗的位置。

### 检查油位

1. 切断电机的电源，确保不会被意外接通!

应等待减速机冷却下来 — 有烫伤的危险!

2. 对于带有油量标尺的减速机:

· 旋出油量标尺并且拉出。清洁油量标尺并且重新放入减速机中（不要用力拧紧!）

· 将油量标尺重新拉出并且检查油量高度，有可能要修正：正确的油位必须处于刻度（=最大油位）和油量标尺末端（=最小油位）之间

3. 对于带有油位观察窗（选项）的减速机：目视检查油位是否正确（=油位观察窗中心位置）

### 检查机油

1. 切断电机的电源，确保不会被意外接通!

应等待减速机冷却下来 — 有烫伤的危险!

2. 在放油塞处取出一些机油

3. 检查机油的状况

· 粘性

· 如果机油看起来很脏，除了“检修和维护间隔时间”章节中规定的维护间隔时间之外，建议更换机油

### 7.3 减速机检修/ 维护作业

· 合成润滑剂不可混合使用，也不得与矿物润滑剂混合

### 更换机油

在更换机油时请您彻底清理减速机壳体上的残留机油和输出轴。为此



您可以使用与减速机机油相同类型的机油。

### 1. 切断电机的电源，确保不会被意外接通！

等待减速机冷却下来 — 有烫伤的危险！

说明：减速机必须仍然有余温，因为冷机油的流动性差，影响正确排放。

2. 将一个容器置于放油塞下方

3. 拆下注油塞、通气管塞和放油塞。

4. 将机油完全放掉

5. 装好机油排放螺钉

6. 使用加油过滤器加注机油。通过机油加注螺钉加入同类型的机油（否则必须与客户服务部联系）。

· 根据铭牌上的规定加注机油（参见铭牌）。铭牌上规定的油量为参考值。应以油量标尺上的刻度为准。

· 使用油量标尺检查油位是否正确。

7. 装好机油加注螺钉。

8. 装好通气管塞。

9. 清洁机油过滤器，如果有必要的话就要更换滤芯（在使用外部油气或者油水冷却装置时）。

当您去除减速机盖板时，您必须在密封面上重新涂抹密封剂。否则减速机的密封性能不能得到保证！此种情况下请务必与 DONLY 公司进行联系！

### 清洁机油加热装置

如果在机油加热装置上形成机油结块，拆下机油加热装置进行清洁。

拆卸机油加热装置

请您务必注意在放掉机油之前一定要将加热棒切断电源。过热的加热棒可能会使机油蒸汽发生爆炸

**注意，加热棒不得因划伤或者刮伤而弄坏！**

安装机油加热装置

· 安装减速机上的机油加热装置和密封圈。管状加热棒必须始终浸没在液体之中。

· 使用加热棒伤的固定环安装好接线盒底座。

· 确保接线盒和加热棒上端之间的密封圈位置正确无误。

· 将温度传感器插入减速机油箱中。在恒温器上检查所需的接通温度。

### 加满密封油脂

您可以使用黄油来润滑安装在传动轴和输出轴上的可添加润滑剂的灰尘防护盖或者迷宫式密封装置。

添加润滑油的位置可以在与订单相关的尺寸图上找到。每个添加润滑剂的润滑嘴上使用大约 30 克润滑脂，与添加润滑脂的位置和减速机规格无关。

备注: \_\_\_\_\_

## 8 运行故障

### 8.1 减速机故障

故障	可能原因	排除方法
异常、均匀的运转噪声	A 滚动/碾压噪声; 轴承损坏 B 敲击式噪声; 啮合不均匀	A 检查机油 (参见“检修和维护”章节); 更换轴承 B 与客户服务中心咨询
异常、不均匀的运转噪声	机油中有异物	• 检查机油 (参见“检修和维护”章节) • 停止运转传动装置, 与客户服务中心咨询
在减速器固定区域内的异常噪声	减速器固定件有松动	• 使用规定的转矩拧紧固定螺钉和螺母 • 更换受伤的/损坏的固定螺钉/螺母
运行温度太高	A 机油太多 B 机油过于陈旧 C 机油太脏 D 对于使用散热风扇的减速器: 进气口/减速器箱体太脏 E 轴端泵损坏 F 油气或者油冷却装置上的故障	A 检查油位, 有可能要修正 (参见“检修和维护”章节) B 检查上一次更换机油的时间; 有可能要更换机油 (参见“检修和维护”章节) C 检查机油 (参见“检修和维护”章节) D 检查进气口; 可能需要清理, 清理减速器箱体 E 检查轴端泵; 可能需要更换 F 注意油水和油气冷却装置的使用说明书!
轴承位置上的温度太高	A 机油太少 B 机油过于陈旧 C 轴端泵损坏 D 轴承受伤	A 检查油位, 有可能要修正 (参见“检修和维护”章节) B 检查上一次更换机油的时间; 有可能要更换机油 (参见“检修和维护”章节) C 检查轴端泵; 可能需要更换 D 检查轴承; 可能需要更换, 与客户服务中心联系
机油泄漏 <sup>1</sup> • 在装配盖上 • 在减速器盖上 • 在轴承盖上 • 在装配法兰上 • 在传动或者输出轴密封环上	A 在装配盖 (MC2P) / 减速器外盖 / 轴承盖 / 装配法兰上的密封环不密封 B 轴密封环的密封唇翘起 C 轴密封环受损坏 / 磨损	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; 与客户服务中心咨询 B 给减速器排气 (参见“构造型式”章节)。观察减速器, 如果机油继续泄漏; 与客户服务中心咨询 C 与客户服务中心咨询
机油泄漏 • 在放油塞上 • 在通气管塞上	A 机油太多 B 传动装置被安装在错误的构造型式上 C 频繁冷启动 (机油起泡沫) 和 / 或者较高的油位	A 检查油量 (参见“检修和维护”章节) B 正确安装通气管塞 (参见“构造型式”章节) 并且校正油位 (参见铭牌, “润滑油”章节)
油气或者油冷却装置上的故障		注意油水和油气冷却装置的使用说明书!
逆止器上的工作温升	逆止器受损 / 损坏	• 检查逆止器; 可能需要更换 • 与客户服务中心咨询

1 在轴密封环上泄露的(少量)油脂在磨合期内(24小时运转时间)可看作正常现象。

## 客户服务







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:

- 完整的铭牌数据
- 故障类型和范围
- 故障发生的时间和伴随现象
- 可能原因

# 1 Important Notes

Safety and warning instructions

**Always follow the safety and warning instructions in this publication!**

	<b>Electrical hazard</b> Possible consequences: Severe or fatal injuries.
	<b>Hazard</b> Possible consequences: Severe or fatal injuries.
	<b>Hazardous situation</b> Possible consequences: Slight or minor injuries.
	<b>Harmful situation</b> Possible consequences: Damage to the drive and the environment.
	<b>Important information about explosion protection.</b>
	<b>Tips and useful information.</b>



A requirement of fault-free operation and fulfillment of any rights to claim under guarantee is that you adhere to the information in the operating instructions. Consequently, read

the operating instructions before you start working with the gear unit!

The operating instructions contain important information about servicing; as a result, they should be kept in the vicinity of the gear unit.



. It is essential to contact **DONLY** regarding a subsequent change of mounting position!

. The industrial gear units of the are delivered without oil fill.

Refer to the information on the nameplate!

. Refer to the instructions in the sections "Mechanical Installation" and "Startup"!

## ***Waste disposal***

Follow the current instructions:



. Housing parts, gears, shafts and anti-friction bearings of the gear units must be disposed of as steel scrap. The same applies to gray cast iron castings unless there are separate collection

arrangements.

. Collect waste oil and dispose of it correctly.

## 2 Safety Notes

### Preliminary remarks

The following safety notes are concerned with the use of industrial gear units . If the others gear units or motors are used, also refer to the safety notes for motors and gear units in the corresponding operating instructions.

**Also take account of the supplementary safety notes in the individual sections of these operating instructions.**

### General information

During and after operation, industrial gear units and motors have live and moving parts and their surfaces may be hot.

**All work related to transport, storage, setting up/mounting, connection, startup, maintenance and repair may only be performed by trained personnel observing**

- . the corresponding detailed operating instruction(s) and wiring diagrams,
- . the warning and safety signs on the industrial gear unit,
- . the specific regulations and requirements for the system and
- . national/regional regulations governing safety and the prevention of accidents.



**Severe injuries and damage to property may result from**

- . incorrect use,
- . incorrect installation or operation,
- . removal of required protective covers or the housing when this is not permitted.

### Designated use

Industrial gear units are intended for industrial systems. They correspond

to the applicable standards and regulations. The technical data and the information about permitted conditions are provided on the nameplate and in the documentation.

**It is essential to observe all specified information!**

### Transport

Inspect the delivery for any damage in transit as soon as you receive the delivery.

Inform the transport company immediately. It may be necessary to preclude startup.

### Startup/operation

Check that the direction of rotation is correct in decoupled status (also listen 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 main 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

Refer to the instructions in Sec. "Inspection and Maintenance."



## 2.1 Transport of industrial gear units

### Transport eyebolts

Tighten screwed in transport eyebolts firmly. They are only designed for the weight of the industrial gear unit including the motor connected via motor adapter; do not attach any additional loads.



. The main gear unit must only be lifted using lifting ropes or chains on the two screwed in transport eyebolts on the main gear unit. The weight of the gear unit is indicated on the nameplate or the dimension sheet. The loads and regulations specified on the nameplate must always be observed.

. The length of the lifting chains or ropes must be dimensioned in such a way that the angle between the chains or ropes does not exceed 45°.

. Eyebolts on the motor, auxiliary gear unit or primary gear unit must not be used for transport!

. Use suitable, sufficiently rated handling equipment if necessary. Before startup, remove securing devices used for transport.

## 2.2 Corrosion protection and storage conditions

### Overview

Industrial gear units are delivered without oil fill. Observe the corrosion protection required for the various storage periods listed in the following table:

Storage period	Storage conditions	
	Outdoors, roofed	Indoors (dry, warm air, heated if required)
6 months	Standard protection	Standard protection
12 months	Consult with DONLY	Standard protection
24 months	Long-term protection	Consult with DONLY
36 months	Consult with DONLY	Long-term protection
Sea transport, storage in areas close to the sea	Consult with DONLY	Long-term protection

### Standard protection

- . The gear unit is delivered on a palette without cover.
- . Protection of the inside of the gear unit: Gear units undergo a test run with protection oil.
- . Oil seals and seal surfaces are protected through bearing grease.
- . DONLY applies a protective coating to unpainted surfaces, including spare parts. Before assembly or before other equipment is mounted to such surfaces, the protective coating must be removed. To do so, clean the surface with solvent.
- . Small spare parts and loose pieces, such as screws, nuts, etc., are supplied in corrosion protected plastic bags.
- . Threaded holes and blind holes are covered by plastic plugs.

. The corrosion protection is not intended for long-term storage or for humid conditions. The operator is responsible for keeping the gear unit in corrosion-free condition.

. The breather plug (Position → Sec. "Mounting Positions") is already installed at the factory.

Long-term protection

. The gear unit is packaged in a seaworthy plywood box and is delivered on a palette. This way, the gear unit is protected from humidity and shock. DONLY recommends a seaworthy package if the gear unit will be stored for an extended period of time or if protection against salty air is required.

. Protection of the inside of the gear unit apart from standard protection: A solvent in the form of a vapor phase inhibitor is sprayed through the oil filling hole. Inhibitors

are volatile, fixed substances that saturate the ambient air with their vapor in closed rooms. If the inside of the gear unit is subjected to such an atmosphere, then an invisible VPI film forms on the components inside the gear unit. This film serves as corrosion protection. After this protection treatment, the solvent vapors (methanol, ethanol) should have evaporated before closing the gear unit. The breather plug (Position → Sec. "Mounting Positions") is replaced with a screw plug. The screw plug must be screwed into the gear unit again before startup. Repeat the long-term protection treatment after 24 or 36 months (→ Overview of corrosion protection conditions).



. **Never open the gear unit near open flames, sparks and hot objects because the solvent vapors might be ignited.**

. **Take preventive measures to protect people from solvent vapors. It is absolutely crucial that open flames are avoided when the solvent is applied and when the solvent evaporates.**

. DONLY applies a protective coating to unpainted surfaces, including spare parts. Before assembly or before other equipment is mounted to such surfaces, the protective coating must be removed. To do so, clean the surface with solvent.

. Small spare parts and loose pieces, such as screws and nuts are supplied in corrosion protected plastic bags.

. Threaded holes and blind holes are covered by plastic plugs.

### 3 Lubrication of industrial gear units

Depending on the mounting position, the lubrication types "splash lubrication" or "bath lubrication" are used for industrial gear units.

#### Splash lubrication








Splash lubrication is used for industrial gear units in horizontal mounting position. With splash lubrication, the oil level is low. With this lubrication method, oil is splashed onto the bearings and gearing components.

#### Oil bath lubrication

Oil bath lubrication is used for industrial gear units in vertical mounting position and upright mounting position. With oil bath lubrication, the oil level is so high that the bearings and gearing components are completely submerged in the lubricant.

## Symbols used

The following table shows which symbols are used in the subsequent figures and what they mean.

Symbol	Meaning
	Breather plug
	Inspection opening
	Oil dipstick
	Oil drain plug
	Oil filling plug
	Oil sight glass
	Air outlet screw

## Pressure lubrication

If requested, pressure lubrication is possible as lubrication method disregarding the mounting position.

With pressure lubrication, the oil level is low. The gearing components and bearings not submerged in the oil bath are lubricated through a shaft end pump or a motor pump.

The lubrication method "pressure lubrication" is used when

- . oil bath lubrication is not desired for upright or vertical mounting positions
- . input speeds are very high
- . the gear unit must be cooled by an external oil/water

## 4 Mechanical Installation

### 4.1 Required tools / resources

Not included in the scope of delivery:

- . Wrench set
- . Torque wrench (for shrink discs)
- . Mounting device
- . Shims and spacing rings if necessary
- . Fasteners for input and output elements
- . Lubricant
- . For hollow shaft gear units
- . Threaded rod, nut , retaining screw, ejector screw
- . Securing components

## Installation tolerances

Shaft end	Flanges
Diametric tolerance in accordance with ISO . ISO k6 for solid shafts with $d \leq 50$ mm . ISO m6 for solid shafts with $d > 50$ mm . ISO H7 for hollow shafts for shrink disc . ISO H8 for hollow shafts with keyway	Centering shoulder tolerance: . ISO js7 / H8

### 4.2 Before you begin

The drive may only be installed if

- . the data on the nameplate of the motor match the supply voltage
  - . the drive is not damaged (no damage resulting from transport or storage)
- and

. the following requirements have been properly met:

- with standard gear units:

ambient temperature according to the lubricant table in Sec. "Lubricants",  
 no oil, acid, gas, vapors, radiation, etc.

- with special versions:

drive configured in accordance with the ambient conditions

### 4.3 Preliminary work

Output shafts and flange surfaces must be completely free of anti-corrosion agents, contamination or other impurities (use a commercially available solvent). Do not let the solvent get in contact with the sealing lips of the oil seals: danger of damage to the material!

### 4.4 Gear unit foundation

Foundation for foot-mounted gear units

To ensure quick and successful mounting, the type of foundation should be correctly selected and the mounting carefully planned in advance. Foundation drawings with all necessary construction and dimension details should be available.

When mounting a gear unit onto steel framework, special attention should be paid to the rigidity of this framework to prevent destructive vibrations and oscillations. The foundation must be dimensioned according to weight and torque of the gear unit by taking into account the forces acting on the gear unit.

### Tightening torques

Screw / nut	Tightening torque screw / nut [Nm]
M20	315
M24	540
M30	1090
M36	1900

#### 4.5 Mounting of solid shaft gear units

Mount the gear unit in the following order:

1. Mount the components according to Sec. "Gear unit foundation". The shims facilitate later adjustment and, if necessary, to mount a replacement gear unit.
2. Secure the gear unit at the selected positions on the supporting girders using three foundation screws. Position the foundation screws at maximum possible distance (two screws on one side of the gear unit and one on the other side). Align the gear unit as follows:
  - vertically by lifting, lowering or tilting the unit using the nuts of the foundation screws
  - horizontally by tapping the foundation screws slightly into the required direction
3. After having aligned the gear unit, tighten the three nuts of the foundation screws used for alignment. Carefully insert the fourth foundation screw into the supporting girder and tighten it securely. When doing so, make sure that the position of the gear unit does not change. If necessary, realign the gear unit.
4. Tack-weld the ends of the foundation screws to the supporting girders (at least three welding spots per foundation screw). Tack-weld the foundation screws alternately in both directions (starting from the middle) on each side of the center line of the gear unit. This way, misalignment caused by the welding process is avoided. After having tack-welded all screws, they must be welded all the way round in the above mentioned order. Adjust the nuts on the foundation screws to ensure that the welded foundation screws do not twist the gear unit housing.
5. After having tack-welded the nuts of the retaining screws of the gear unit, check the mounting and carry out grouting.

6. When the grouting concrete has set, check the mounting a last time and adjust, if necessary.

#### Mounting accuracy when aligning

When aligning the gear unit, make sure that the mounting tolerances for the evenness of the foundation are not exceeded (values  $y_{max}$  in below table). If necessary, use shims to align the gear unit on the foundation plate.

JE [mm]	$y_{max}$ [mm]
< 400	0.035
400 ... 799	0.060
800 ... 1200	0.090
1200 ... 1600	0.125

#### 4.6 Mounting / removing hollow shaft gear units with keyed connection

. Included in the scope of delivery (→Figure):



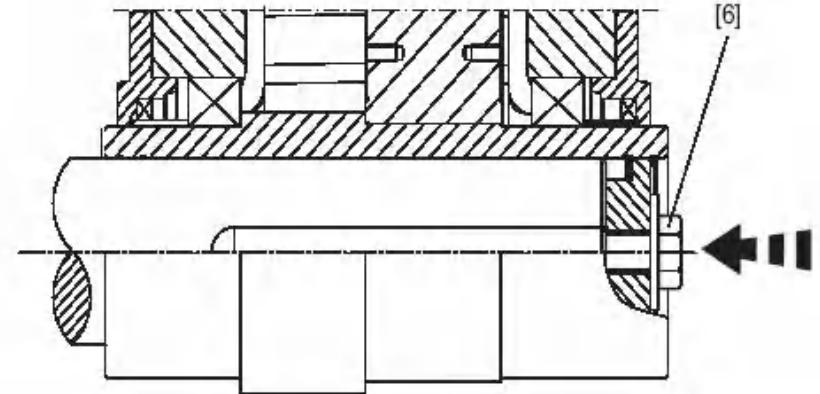
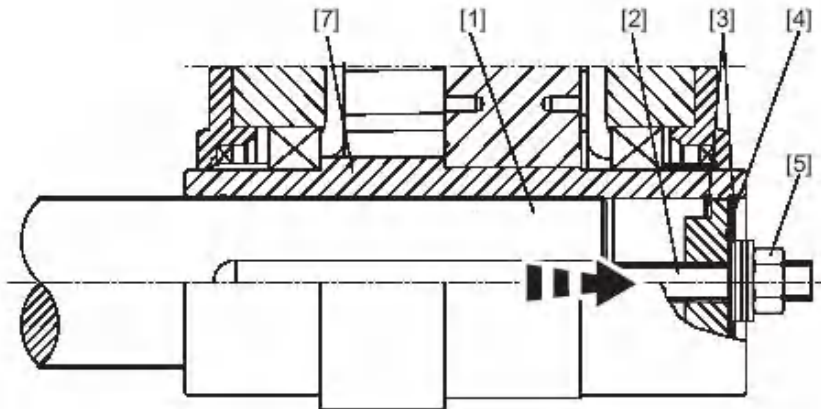
- Circlips [3], end plate [4]
- . Not included in the scope of delivery (→ Figure):
  - Threaded rod [2], nut [5], retaining screw [6], ejector screw [8]

Selecting the adequate thread and length of the threaded rod as well as the retaining screw depends on the design of the customer's machine.

. Apply fluid to the hollow shaft [7] and the shaft end of the customer's shaft [1].

. Push the gear unit onto the customer's shaft [1]. Thread the threaded rod [2] into the customer's shaft [1]. Tighten the customer's shaft [1] with the nut [5] until the shaft end of the customer's shaft [1] and the end plate [4] meet.

. Loosen the nut [5] and unscrew the threaded rod [2]. After having mounted the gear unit, secure the customer's shaft [1] using the retaining screw [6].



[1] Customer's shaft

[2] Threaded rod

[3] Circlips

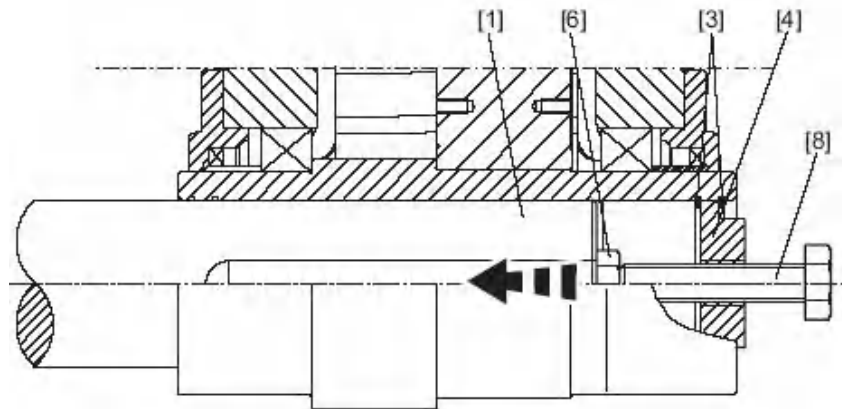
[4] End plate

[5] Nut

[7] Hollow shaft

. To mount and secure the gear unit, attach the circlips [3] and the end plate [4] on the hollow shaft bore.

Removing the hollow shaft gear unit from the customer's shaft



[1] Customer's shaft

[3] Circlips

[4] End plate

[6] Retaining screw

[8] Ejector screw

. Remove the retaining screw [ 6].

. Remove the outer circlip [3] and the end plate [4].

. Thread the retaining screw [6] into the customer's shaft [1].

. Flip the end plate [4] and remount the end plate and the outer circlip [3].

. Thread the ejector screw [8] into the end plate [4] to remove the gear unit from the customer's shaft [1].

#### 4.7 Mounting / removing hollow shaft gear units with shrink disc



A shrink disc serves as connecting element between the hollow shaft of the gear unit and the customer's shaft. For the shrink disc type used, refer to the order documents.

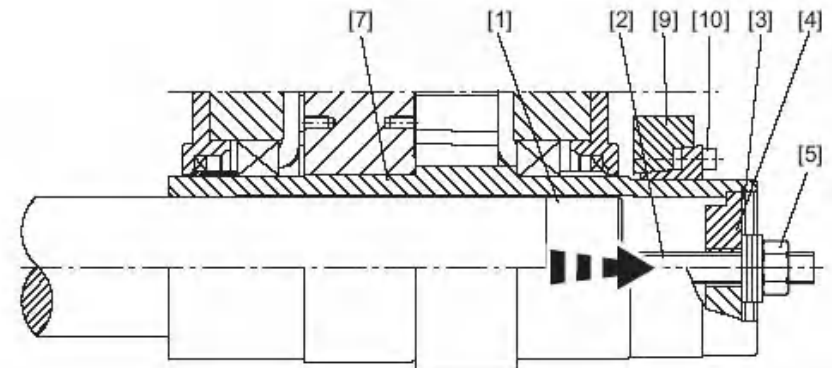
. Included in the scope of delivery (→Figure) :

- Circlip [3], end plate [4]

. Not included in the scope of delivery (→ Figure) :

- Threaded rod [2], nut [5], retaining screw [6], ejector screw [8]

Selecting the appropriate thread and length of the threaded rod as well as the retaining screw depends on the design of the customer's machine.



[1] Customer's shaft

[2] Threaded rod

[3] Circlip

[4] End plate

[5] Nut

[7] Hollow shaft

[9] Shrink disc

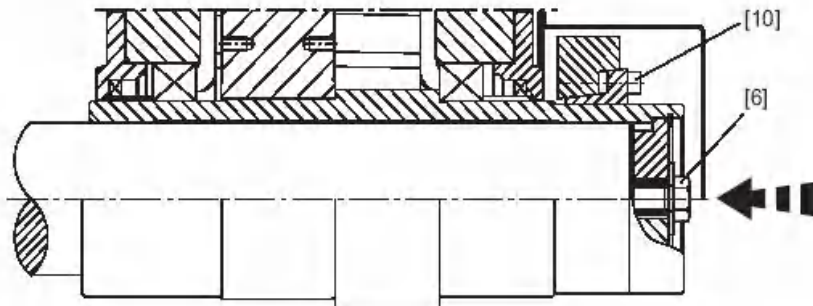
[10] Locking screws

. Before mounting the gear unit, degrease the hollow shaft bore and the customer's shaft [1].

. To mount and secure the gear unit, attach the circlips [3] and the end plate [4] on the hollow shaft bore.

. Push the gear unit onto the customer's shaft [1]. Thread the threaded rod [2] into the customer's shaft [1]. Tighten the customer's shaft [1] with the nut [5] until the shaft end of the customer's shaft [1] and the end plate [4] meet.

. Loosen the nut [5] and unscrew the threaded rod [2]. After having mounted the gear unit, secure the customer's shaft [1] using the retaining screw [6].



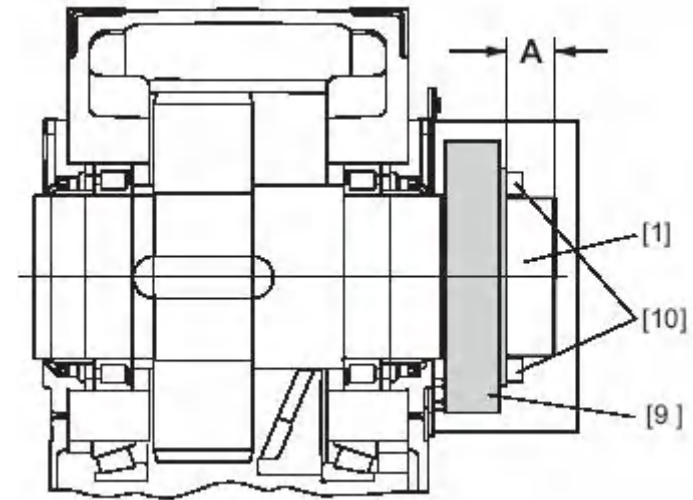
### Mounting the shrink disc

. Do not tighten the locking screws [10] before the customer's shaft [1] has been mounted, else the hollow shaft could be deformed!

. Apply a small amount of fluid to the area where the shrink disc [9] is seated on the hollow shaft.

. Slide the shrink disc [9] with untightened screws onto the hub of the hollow shaft bore. Position the customer's shaft [1] in the hollow shaft bore. Next move the shrink disc [9] by dimension A from the shaft end of

the hollow shaft:



[1] Customer's shaft

[9] Shrink disc

[10] Locking screws

### Removing the shrink disc

. Loosen the locking screws evenly one after the other in several stages in clockwise direction, to avoid tilting the shrink disc. Do not remove the locking screws entirely because the shrink disc might spring off.

. If the rings do not loosen, remove as many screws as forcing-off threads exist and turn the screws into the forcing-off threads until the taper bushing comes off from the taper ring.

. Remove the shrink disc from the hollow shaft.

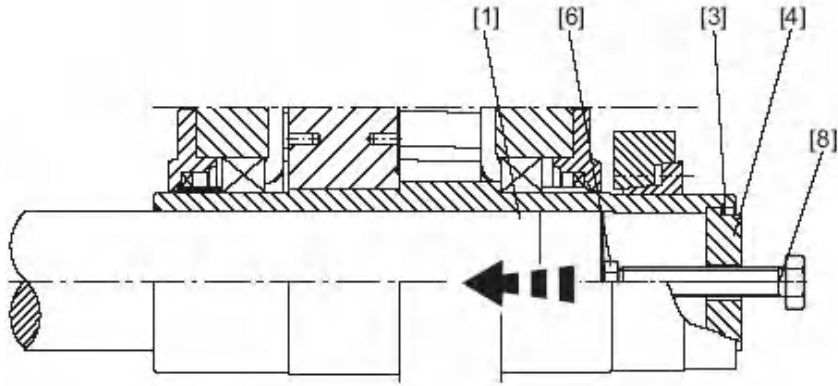


Refer to the separate documentation for mounting / removing hollow shaft gear units if other types are used.

### Removing the hollow shaft gear unit from the



## customer's shaft



[1] Customer's shaft

[3] Circlip

[4] End plate

[6] Retaining screw

[8] Ejector screw

- . Remove the retaining screw [6].
- . Remove the outer circlip [3] and the end plate [4].
- . Thread the retaining screw [6] into the customer's shaft [1].
- . Flip the end plate [4] and remount the end plate and the outer circlip [3].
- . Thread the ejector screw [8] into the end plate [4] to remove the gear unit from the customer's shaft [1].

## 5 Mechanical Installation Options

### 5.1 Important installation instructions



**Disconnect the motor from the power supply before starting work and secure it against unintentional restart!**

### Important installation notes



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

. Never mount couplings, pinions, etc. onto the shaft end by hitting them with a hammer (damage to bearings, housing and the shaft!).



. Observe correct tension of the belt for belt pulleys (in accordance with manufacturer's specifications).

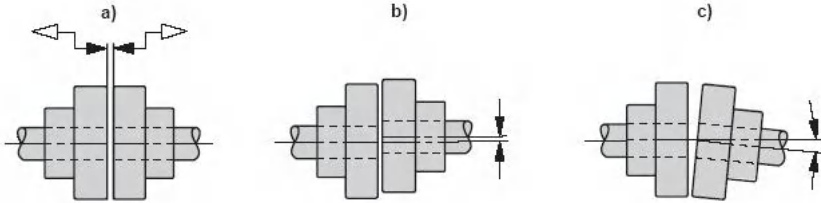
. Power transmission elements should be balanced after insertion and must not give rise to any impermissible radial or axial forces.

Note:

Installation is easier if you first apply lubricant to the output element or heat it up briefly (to 80-100 °C).

Adjust the following misalignments when mounting couplings:

- a) Axial misalignment (maximum and minimum clearance)
- b) Offset misalignment (concentric running fault)
- c) Angular misalignment



Input and output elements such as couplings must be equipped with a protection cover!

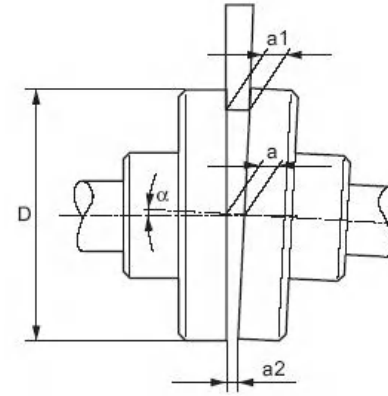
Note:



The following methods for measuring angular and axial misalignment are important for complying with the mounting tolerances specified in Sec. "Mounting of couplings"!

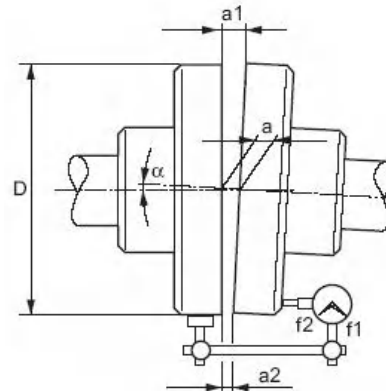
Measuring of angular misalignment with a feeler gauge

The following figure shows the measurement for angular misalignment ( $\alpha$ ) using a feeler gauge. When using this method, an accurate result is only achieved when the deviation of the coupling faces is eliminated by turning both coupling halves by  $180^\circ$  and the average value is then calculated from the difference ( $a1 - a2$ ).



### Measuring of angular misalignment using a micrometer dial

The following figure shows the measurement for angular misalignment using a micrometer dial. This measuring method provides the same result as described under "Measuring angular offset with a feeler gauge" if the coupling halves are rotated together, for instance with one coupling pin, so that the needle of the micrometer dial does not move noticeably on the measuring surface.

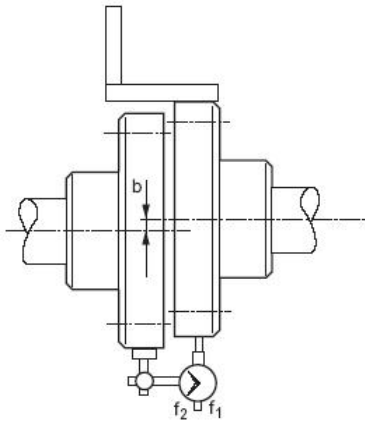


A prerequisite for this measuring method is that there is no axial play in

the shaft bearings when the shafts rotate. If this condition is not fulfilled, the axial play between the faces of the coupling halves must be eliminated. As an alternative, you can use two micrometer dials positioned on the opposite sides of the coupling (to calculate the difference of the two micrometer dials when rotating the coupling).

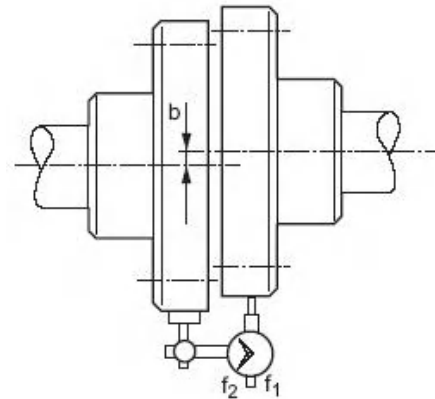
Measuring of offset misalignment using straight-edge and micrometer dial

The following figure shows the measurement for offset misalignment using a straightedge. Permissible values for eccentricity are usually so small that the best measurement results can be achieved with a micrometer dial. If you rotate one coupling half together with the micrometer dial and divide the deviation by two, the micrometer dial will indicate the deviation and as a result the misalignment (dimension "b"), which includes the offset misalignment of the other coupling half.



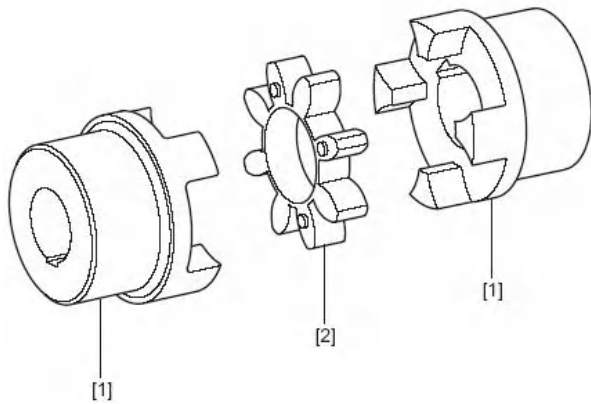
### Measuring of offset misalignment using a micrometer dial

The following figure shows the measurement for offset misalignment using a more accurate measuring method. The coupling halves are rotated together without the tip of the micrometer dial moving on the measuring surface. The offset misalignment is obtained by dividing the deviation indicated on the micrometer dial (dimension "b").



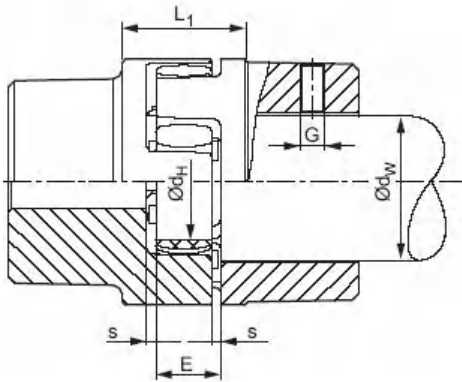
## 5.2 Mounting of couplings

### Quincunx coupling



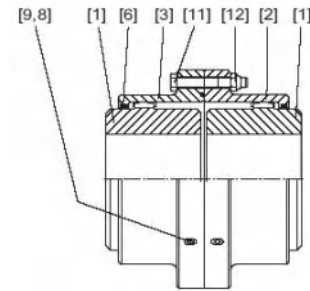
[1] Coupling hub [2] Ring gear

The low-maintenance, Quincunx coupling is capable of compensating radial and angular misalignment. Careful and exact alignment of the shaft ensures long service life of the coupling.

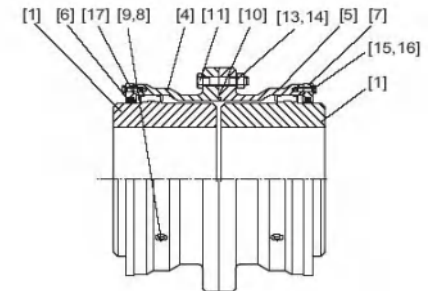


The shaft distance must be strictly observed (dimension E) to ensure axial play of the coupling.

### Dentate couplings



[1] Coupling hub  
[2] Sleeve  
[3] Sleeve  
[4] Sleeve (male)  
[5] Sleeve (female)  
[6] Seal or O-ring  
[7] Cover  
[8] Grease nipple  
[9] Grease nipple

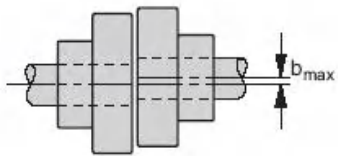


[10] Gasket  
[11] Bolt  
[12] Self-locking nut  
[13] Washer  
[14] Nut  
[15] Bolts  
[16] Washer  
[17] O-ring

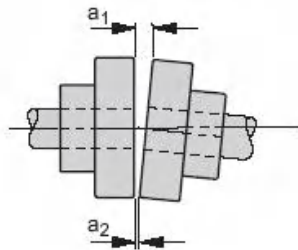
- . Before mounting the coupling, thoroughly clean the individual parts of the coupling, in particular the toothing.
- . Grease the O-rings [6] slightly and place them into the corresponding grooves in the sleeve [2, 3].
- . Grease the toothing of the sleeves [2,3] and push the sleeves onto the shaft ends without damaging the O-rings [6].
- . Slide the coupling hubs [1] onto the shaft. Move hubs to be flush with the shaft end.
- . Align the machine to be coupled and check the shaft distance.
- . Align both axes and check the permitted values using a dial indicator. The mounting tolerances depend on the coupling torque.
- . Before you screw on the sleeves [2, 3], have the coupling hugs [1] cool off and grease the toothing.
- . Insert the gasket [10] and tighten the sleeve halves to the specified tightening torque. Grease the gasket slightly to facilitate mounting.
- . It is important that the grease nipples [9] on the two sleeve halves [4, 5] are positioned at an angle of 90° towards each other after having tightened the sleeves.

### Mounting tolerances

#### Offset misalignment



#### Angular misalignment



### 5.3 Backstop

The purpose of a backstop is to prevent undesirable reverse rotation. During operation, the backstop permits rotation in one specified direction of rotation only.

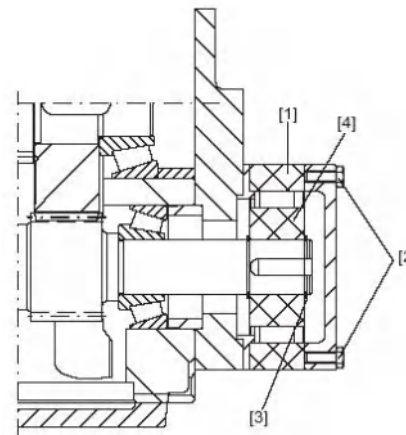


- . Do not start up the motor in blocking direction. Ensure correct connection of power supply with motor to achieve the desired direction of rotation! Running the motor in blocking direction might destroy the backstop!
- . Contact **ONLY** if you want to alter the blocking

direction!

#### Changing the direction of rotation

To change the direction of rotation, turn the inner ring with the sprags by 180°. Pull out the inner ring with the sprags using a pulling-off device (not included in the scope of delivery) and replace turned by 180°.



[1] Outer ring

[2] Retaining screws

[3] Circlip

[4] Inner ring with cage and sprags

- . Loosen the retaining screws [2] of the backstop.
- . Remove the outer ring [1]. To facilitate dismounting, slightly turn the outer ring [2] in freewheeling direction.
- . Remove circlip [3], and inner ring with cage and sprags [4].
- . Turn the inner ring [4] with the sprags by 180° and replace the parts in reverse order. When mounting the backstop, do not apply pressure to the cage with the sprags but to the inner ring [4] only. Use the threaded holes on the inner ring [4] for mounting.
- . Lock the inner ring [4] with the circlip [3] in axial direction. Mount the outer ring [1] using the retaining screws [2]. Observe the tightening torques specified in the table below:

Screw size	Tightening torque [Nm]
M5	6
M6	10
M8	25
M10	48
M12	84
M16	206
M20	402
M24	696
M30	1420

- . Alter the direction arrow on the gear unit housing .
- . After mounting, check that the backstop runs smoothly.

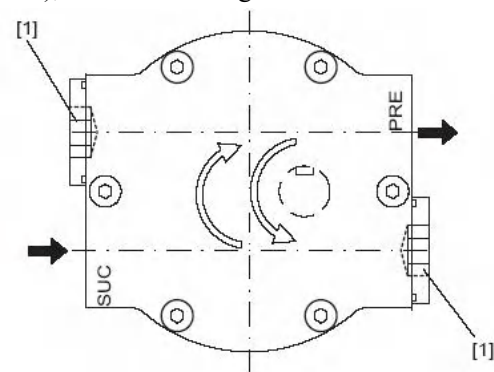
#### 5.4 Shaft end pump

Shaft end pump can be used to lubricate gear unit that are not submerged in the oil bath. The shaft end pump can be operated in both directions of

rotation.

#### Pump suction

The intake and delivery pipe or tube is connected disregarding the direction of rotation of the output shaft and must not be altered. If the shaft end pump does not build up pressure within 10 seconds after the gear unit has been started (→ Flow monitoring via oil sight glass on the gear unit), do the following:



[1] Plug connector

[SUC] Suction line

[PRE] Pressure line

- . Loosen the plug-in connection [1] next to the intake pipe / intake tube on the valve housing. Fill the suction line [SUC] and the pump with oil.
- . Turn the pump so that the gear pump is lubricated with oil.
- . Make sure that the pump can create a vacuum in the suction line [SUC] so the oil flow can start.



. It is essential that the gear unit is sufficiently lubricated from the very beginning!

. Do not change the diameter of the tube / pipe

connection!

. Do not open the pressure line [PRE]!

### 5.5 Oil heater

#### Activation / deactivation behaviour

Oil heating is required to ensure lubrication at startup when the ambient temperature is low (e.g. cold start of the gear unit).

The oil heater

. is activated when the temperature set at the factory is reached

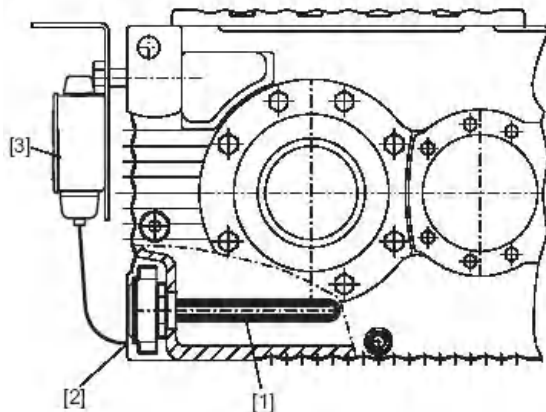
. is deactivated when the set temperature is exceeded by 8°C to 10°C



It is essential that you check the following points before activating the oil heater:

. Check for correct electrical connection according to the ambient conditions

. Check for correct oil grade and oil volume of the gear unit (→ Nameplate) There is a potential danger of explosion if the oil heater is not connected correctly or is operated above the oil surface!



[1] Oil heater

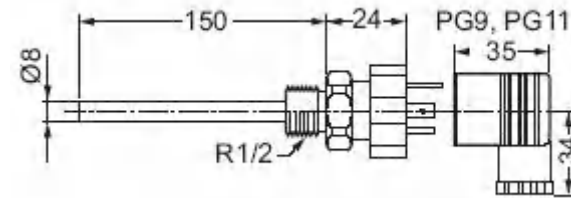
[2] Temperature sensor

[3] Thermostat

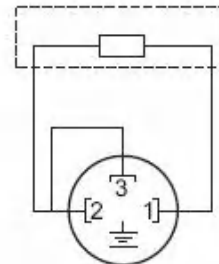
### 5.6 Temperature sensor PT100

The temperature sensor PT100 can be used to measure the temperature of the oil in the gear unit.

Dimensions

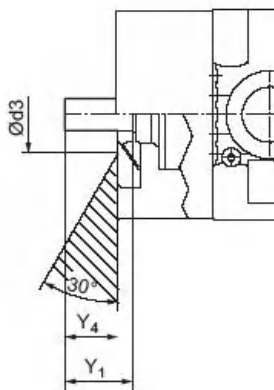


Electrical connection



## 5.7 Fan

A fan can be mounted if the projected thermal power of the gear unit is exceeded. A fan can be retrofitted if the ambient conditions change after having installed the gear unit. The direction of rotation of the gear unit does not influence the operation of the fan.



**Make sure that air intake vents are not blocked or covered!**

## 5.8 Connecting the oil/water cooling system

Follow the instructions in the separate manufacturer's documentation when connecting the oil/air cooling system.

## 5.9 Connecting the motor pump



Follow the instructions in the separate manufacturer's documentation when connecting the motor pump.

## 6 Startup

### 6.1 Startup of gear units



. It is essential to adhere to the safety notes in Sec. "Safety Notes."

. It is absolutely necessary to avoid open flames or sparking when working with the gear unit!

. Take preventive measures to protect people from the solvent vapors generated by the vapor phase inhibitor!

. Before startup, check for correct oil level! For lubricant fill quantities, refer to Sec. "nameplate."

. For gear units with long-term protection: Replace the screw plug on the location indicated by the breather plug .

### Before startup

. For gear units with long-term protection: Remove the gear unit from the seaworthy protection box.

. Remove the corrosion protection agent from the gear unit parts. Make sure gaskets, sealing surfaces and sealing lips are not damaged by mechanical abrasion, etc.

. Before filling the gear unit with the correct oil grade and volume, drain the remaining amount of protection oil. To do so, unscrew the oil drain



plug and drain the remaining protection oil. Thread the oil drain plug back in place.

. Remove the oil filling plug. Use a funnel to fill the oil. Fill the gear unit with the correct oil grade and volume (→ Sec. "Nameplate"). The oil volume specified on the nameplate of the gear unit is a reference value. The mark on the dipstick is the decisive indicator of the correct oil level. Check for correct oil level (= below the "max" mark on the dipstick) using the oil dipstick. After having filled the oil, replace the oil filling plug.

. Make sure that rotating shafts as well as couplings are equipped with suitable protective covers.

. If the gear unit has a motor pump, check for proper functioning of the pressure lubricating system. Make sure that monitoring devices are connected properly.

. After an extended period of storage (max. two years), have the gear unit operate without load with the correct oil fill (→ Sec. "Nameplate"). This way, the correct functioning of the lubricating system and particularly the oil pump is ensured.

. If the gear unit is equipped with a fan on the input shaft, check for free air intake within the specified angle.

#### **Running-in period**

DONLY recommends running-in the gear unit as first startup phase. Increase load and revolutions in two to three steps up to maximum level. The running-in phase takes about 10 hours.

#### **Check the following points during the running-in phase:**

. Verify the power values specified on the nameplate because their frequency may be a decisive factor for the service life of the gear unit.

. Does the gear unit run smoothly?

. Are there vibrations or unusual running noise?

. Are there signs of oil leakages on the gear unit?



For further information and troubleshooting, refer to Sec. "Malfunctions."

#### **6.2 Startup gear units with backstop**



For gear units with backstop, make sure the direction of rotation of the motor is correct!

#### **6.3 Taking gear units out of operation**



**Disconnect the drive from voltage supply and secure it to prevent unintentional restart!**

If the gear unit is not operated for a longer period of time, you must activate it at regular intervals every two to three (2 to 3) weeks.

If the gear unit is not operated for a period longer than six (6) months, additional corrosion protection is required:

**. Corrosion protection for the inside of gear units with splash lubrication or bath lubrication:**

Fill the gear unit up to the breather plug with the oil grade specified on the nameplate.

**. Corrosion protection for the inside of gear units with oil pressure lubrication:**

Contact DONLY in this case!

**. Surface corrosion protection:**

Apply a wax-based protective coating onto shaft ends and unpainted surfaces as corrosion protection. Grease the sealing lips of the oil seal to protect them from preservative agents.



For taking the gear unit back into operation, refer to Sec. "Startup."

## 7 Inspection and Maintenance

### 7.1 Inspection and maintenance intervals

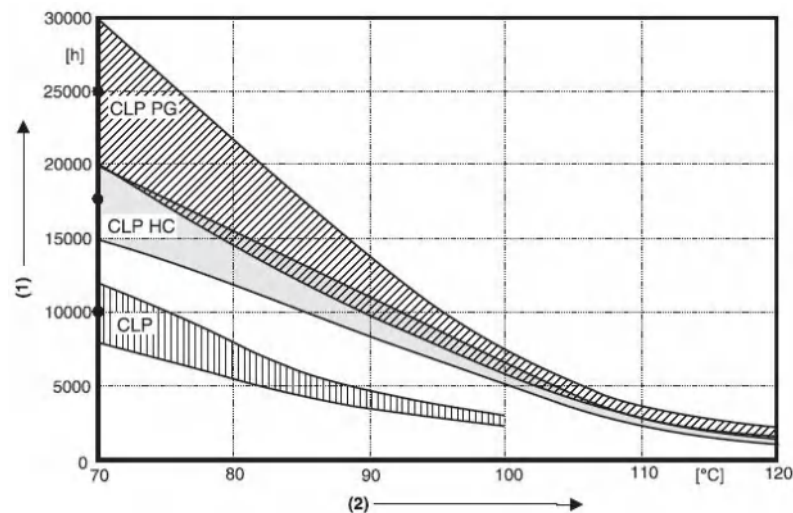
Interval	What to do?
<ul style="list-style-type: none"> <li>Daily</li> </ul>	<ul style="list-style-type: none"> <li>Check the housing temperature:                             <ul style="list-style-type: none"> <li>with mineral oil: max 90 °C</li> <li>with synthetic oil: max. 100 °C</li> </ul> </li> <li>Check gear unit noise</li> <li>Check the gear unit for signs of leakage</li> </ul>
<ul style="list-style-type: none"> <li>After 500 - 800 hours of operation</li> </ul>	<ul style="list-style-type: none"> <li>First oil change after initial startup</li> </ul>
<ul style="list-style-type: none"> <li>After 500 hours of operation</li> </ul>	<ul style="list-style-type: none"> <li>Check the oil level, refill oil (→ Nameplate) if necessary</li> </ul>
<ul style="list-style-type: none"> <li>Every 3000 hours of operation, at least every 6 months</li> </ul>	<ul style="list-style-type: none"> <li>Check the oil: If the gear unit is operated outdoors or in humid conditions, check the water content of the oil. The water content must not exceed 0.05 % (500 ppm).</li> <li>Fill labyrinth seals with grease. Use about 30 g grease per grease nipple.</li> <li>Clean the breather plug</li> </ul>
<ul style="list-style-type: none"> <li>Depending on the operating conditions, at the latest every 12 months</li> </ul>	<ul style="list-style-type: none"> <li>Change the mineral oil (→ Sec. "Inspection and maintenance of the gear unit")</li> <li>Check whether retaining screws are tightly secured</li> <li>Check contamination and condition of the oil/air cooling system</li> <li>Check the condition of the oil/water cooling system</li> <li>Clean oil filter, replace filter element if necessary</li> </ul>
<ul style="list-style-type: none"> <li>Depending on the operating conditions, at the latest every 3 years</li> </ul>	<ul style="list-style-type: none"> <li>Change synthetic oil (→ Sec. "Inspection and maintenance of the gear unit")</li> </ul>
<ul style="list-style-type: none"> <li>Varying (depending on external factors)</li> </ul>	<ul style="list-style-type: none"> <li>Repair or renew the surface/anticorrosion coating</li> <li>Clean the gearcase surface and fan</li> <li>Check the oil heater:                             <ul style="list-style-type: none"> <li>Are all connection cables and terminals tightened securely and free from corrosion?</li> <li>Clean incrustated elements (such as the heating element) and replace, if required (→ Sec. "Inspection and maintenance of the gear unit")</li> </ul> </li> </ul>

### 7.2 Lubricant change intervals



Change the oil more frequently when operating the industrial gear unit under more severe/aggressive environmental conditions!

Mineral CLP lubricants and synthetic polyalphaolefin-based (PAO) lubricants are used for lubrication. The synthetic lubricant CLP HC shown in the following figure corresponds to the PAO oils.



Lubricant change intervals for gear units under normal ambient conditions

(1) Hours of operation

(2) Sustained oil bath temperature

. Average value per oil type at 70°C

### 7.3 Inspection and maintenance of the gear unit



. **Do not mix different synthetic lubricants and do not mix synthetic with mineral lubricants!**

. **For positions of the oil level plug, the drain plug, the breather plug and the oil sight glass.**

#### Checking the oil level

**1. Disconnect the motor from voltage supply and secure it to prevent unintentional restart!**

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

2. For gear units with oil dipstick:

. Unscrew the oil dipstick and remove it. Clean the dipstick and re-insert it into the gear unit (do not screw in tightly!).

. Remove dipstick again and check oil level. Correct if necessary: the oil level is correct when it is between the oil level mark (= maximum oil level) and the end of the dipstick (= minimum oil level)

3. For gear units with oil sight glass (option): Visually check correct oil level (= middle of oil sight glass)

#### Checking the oil

**1. Disconnect the motor from voltage supply and secure it to prevent unintentional restart!**

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

2. Remove some oil from the oil drain plug

3. Check the oil consistency

- Viscosity
- If you can see that the oil is heavily contaminated, we recommend to change the oil disregarding the service intervals specified in Sec. "Service and maintenance intervals."

#### Changing the oil

When changing the oil, clean the gearcase thoroughly to remove oil residues and abrasion. Use the same oil grade as for the operation of the gear unit.

**1. Disconnect the motor from voltage supply and secure it to prevent unintentional restart! Wait until the gear unit has cooled off – Danger of burns! If your gear unit is equipped with an oil expansion tank, let the gear unit cool off until it reaches ambient temperature. The reason is that there might still be oil in the oil expansion tank which might leak through the oil filling hole!**

**Note: The gear unit must still be warm because the high viscosity of cold oil will make it more difficult to drain the oil correctly.**

2. Place a container under the oil drain plug.

3. Remove oil filling plug, breather plug and oil drain plugs. When using a steel oil expansion tank, also remove the air outlet screw on the air expansion tank. To drain the oil completely, blow air through the breather into the oil expansion tank. As a result, the rubber membrane lowers and forces the remaining oil out. The lowering membrane compensates the pressure, which facilitates filling the new oil.

4. Drain the oil completely.

5. Reinstall the oil drain plugs.

6. Use a funnel to fill the oil. Fill new oil of the same type as the old oil via the oil filling plug (if you want to change the oil type, contact our customer service first).

- Fill the oil according to the volume specified on the nameplate (→ Sec. "Nameplate").

The oil volume specified on the nameplate is an approximate value. The

marks on the oil dipstick are decisive for the oil level.

- Check whether the oil level is correct using the oil dipstick.

7. Reinstall the oil filling plug. If your gear unit is equipped with a steel oil expansion tank, also screw in the air outlet screw.

8. Mount the breather plug.

9. Clean the oil filter, replace the filter element if necessary (when using an external oil/water cooling system).



If you remove the housing cover, you must apply new sealing compound to the sealing surface. Else, the tightness of the gear unit is not guaranteed! Contact DONLY in this case!

### **Cleaning the oil heater**

Incrustation on the oil heater caused by oil must be removed. Remove the oil heater for this purpose.



The oil heater must be deactivated before draining the oil. The reason is that the hot oil heater might ignite the evaporating oil.

### **Removing the oil heater**

- . Remove the oil heater [1] and the gasket on the gear unit.
- . Remove the base of the terminal box.
- . Clean the tubular heating elements with solvent.

Be careful not to damage the heating elements through scratching or scraping!

### **Mounting the oil heater**

. Reinstall the oil heater [1] and the gasket on the gear unit. The tubular heating elements must always be immersed in liquid.

. Mount the base of the terminal box onto the heating rod using a mounting ring.

. Make sure that the gasket is placed correctly between terminal box and upper end of the heating element.

. Insert the temperature sensor [2] into the oil sump of the gear unit. Set the required temperature on the thermostat [3].

### **Refilling grease**

You can use grease consistency to grease the regreasable dust protection covers or labyrinth seals attached to input and output shafts as option .

For the locations of regreasing points, refer to the order-specific dimension sheet. Use about 30 g grease per grease nipple disregarding the position of regreasing points and gear unit size.

Remark: \_\_\_\_\_

## 8 Malfunctions

### 8.1 Gear unit malfunctions

Problem	Possible cause	Solution
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"), replace bearings B Contact customer service
Unusual, irregular running noise	Foreign particles in the oil	• Check the oil (see Sec. "Inspection and Maintenance") • Stop the drive, contact customer service
Unusual noise in the area of the gear unit mounting	Gear unit mounting has loosened	• Tighten the retaining screws and nuts to the specified torque • Replace the damaged / defective retaining screws or nuts
Operating temperature too high	A Too much oil B Oil too old C Oil contaminated D Gear units with fan: air intake opening / gearcase contaminated E Shaft end pump defective F Malfunctions of oil/air or oil/water cooling system	A Check the oil level, correct if necessary (see Sec. "Inspection and Maintenance") B Check when the oil was changed last time, change oil if necessary (see Sec. "Inspection and Maintenance") C Change the oil (see Sec. "Inspection and Maintenance") D Check the air intake opening and clean if necessary, clean gear unit housing E Check the shaft end pump, replace if necessary F Observe the separate operating instructions of the oil/water and oil/air cooling system!
Bearing point temperatures too high	A Oil not enough B Oil too old C Shaft end pump defective D Bearing damaged	A Check the oil level, correct if necessary (see Sec. "Inspection and Maintenance") B Check when the oil was changed last time, change oil if necessary (see Sec. "Inspection and Maintenance") C Check the shaft end pump, replace if necessary D Check bearing and replace if necessary, contact customer service
Oil leaking <sup>1</sup> • from cover plate • from gearcase cover • from bearing cover • from mounting flange • from output/input end oil seal	A Gasket on cover plate (MC2P) / gearcase cover / bearing cover / mounting flange leaking B Sealing lip of oil seal upside down C Oil seal damaged / worn	A Tighten the bolts on the respective cover plate and observe the gear unit. Oil still leaking, contact customer service B Vent the gear unit (see →Sec. "Mounting Positions") Observe the gear unit. Oil still leaking, contact customer service C Contact customer service
Oil leaking • from oil drain plug • from breather plug	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 plug correctly (see Sec. "Mounting Positions") and correct the oil level (see Sec. "Lubricants")
Malfunctions of the oil/air or oil/water cooling system		Observe separate operating instructions of the oil/water and oil/air cooling system!
Operating temperature at backstop too high	Damaged / defective backstop	• Check the backstop, replace if necessary • Contact customer service

**1 It is normal for small amounts of oil/grease to emerge from the oil seal during the running-in phase (24 hour running time).**

### Customer service

**Please have the following information available when contacting our customer service:**

- Complete nameplate data
- Nature and extent of the fault
- Time of occurrence and accompanying circumstances of the fault
- Presumed cause