BONENG

中文

PS系列行星回转齿轮箱使用手册

PS Planetary Rotary Gear Units Instruction Use Manual

EN

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中文

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重要提示

在安装操作过程中，
请注意本使用手册中的安全提示和警告提示！

	有电危险 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：损坏传动装置和环境
	使用建议和有用的信息

- 遵守本手册的规定可以让装置无故障运行，同时也满足质量缺陷索赔的要求，因此在使用传动装置进行工作之前，请您先阅读本使用手册；
- 本使用手册包含重要的安装维护提示，请将使用手册保管在靠近设备的位置，以便安装维护参阅；

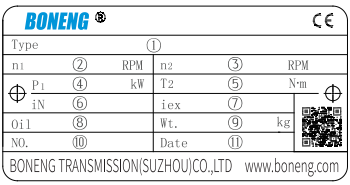
1 安全说明

安全说明主要涉及齿轮箱的使用。当使用齿轮箱时，请注意手册中的相关安全提示！

- ◆使用手册为本公司所供齿轮箱的有机组成部分。
- ◆齿轮箱的安装、操作、维护和修理人员均需认真阅读本手册并遵守其中的规定。
- ◆严格遵循手册中的规定是实现产品无故障运行和履行任何质量保证要求的必要条件。
- ◆在遵循手册规定的前提下还要注意：
  - →相关安全和事故防范的国家（地区）规定；
  - →相关设备的特别规定和要求；
  - →设备装置上的安全警告和安全标志牌。
- ◆下列情况会导致人身伤害和财产损失：
  - →使用不当；
  - →安装或操作失误；
  - →违反规定拆除必要的防护罩或机壳。
- ◆若因违反本手册的规定而造成的任何损伤或停机，本公司概不负责。
- ◆为不断追求技术进步，我们保留对其进行修改的权力。通过不断改进，将在保持基本特性的基础上，有利于进一步提高其使用性能和工作安全性。

2 技术说明

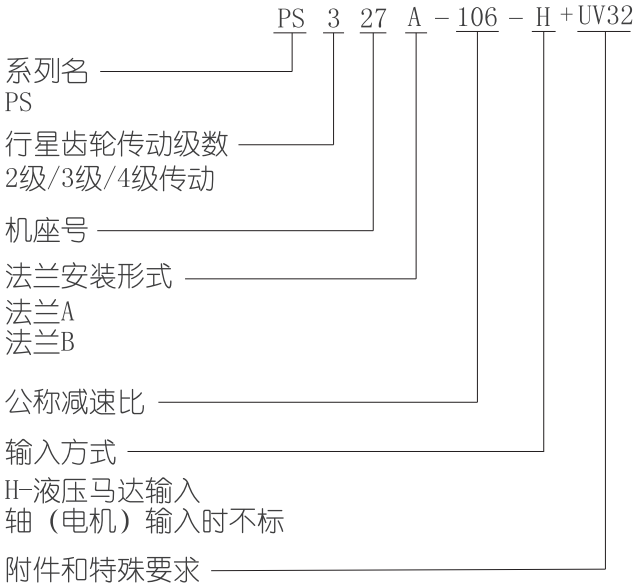
2.1 铭牌说明



铭牌上的数据十分重要，请仔细阅读，并保持其整洁，当需要服务时，请提供铭牌上的产品编号、使用时间及故障类型。

①型号
②输入转速
（直连电机时指电机转速）
③输出转速
（直联电机时才有）
④额定输入功率
（直联电机时指电机功率）
⑤额定输出扭矩
⑥公称减速比
⑦精确减速比
⑧润滑油粘度
⑨重量
⑩产品编号
⑪出厂日期

2.2 型号说明



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2.3 性能说明

◆ PS系列齿轮箱额定动态输出扭矩范围11000Nm-590000Nm。具体产品的性能参数请查阅样本或 BONENG 公司相关技术资料。

2.4 产品说明

◆ PS系列行星回转齿轮箱由PS系列齿轮箱、驱动单元、输出小齿轮和相关附件组成。适用于港口起重机、随车吊和汽车吊、建筑起重机、甲板起重机、集装箱龙门吊、汽车和履带式起重机、海上平台起重机等的回转驱动机构。

2.4.1 齿轮箱

◆ PS系列齿轮箱输出扭矩大、速比范围广、性能可靠。

◆ 该行星齿轮箱太阳轮、行星轮均采用优质合金钢渗碳淬火处理，内齿圈采用优质合金钢表面硬化处理，所有齿轮均磨齿加工。

◆ 行星架和中间连接法兰采用球磨铸铁材料，承载能力高。

2.4.2 驱动单元

◆ 齿轮箱的驱动单元既可以是电机也可以是液压马达，如图1、图2。

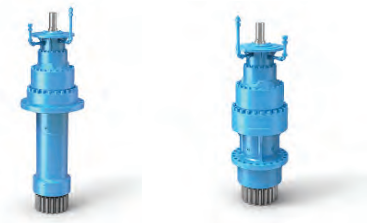

图1 电机驱动

图2 液压马达驱动

2.5 注意事项

◆用户方面对齿轮箱进行的任何有可能影响其安全性和可靠性的改造、变更都是不允许的。所造成的不良后果不在三包服务之内。

◆在齿轮箱上不得进行焊接作业。不得将齿轮箱作为焊接作业的接地点，这样会引起精密的齿轮和轴承零部件无可挽回的损坏。

◆一旦在运行过程中发现异常现象（如温度过高或出现异常声响），应立即停止设备并进行故障检查和排除。

◆务必使用BONENG的原装附件和备件，以排除因使用不合适备件造成的事故。

⚠ 取油样和排放润滑油时请小心打开取油样口和排油口，防止油液飞溅、溢出。

⚠ 只有在齿轮箱处于静止并且卸载的条件下，方可进行拆卸。

3 运输与存放

请在运输前仔细阅读本章节说明，并严格按照相关规定存放设备。

3.1 运输

- 请遵守有关运输的国家法律和规范。
- 请确保产品在用吊车或者叉车吊装时务必由具有资质证明的人员进行操作。
- 请根据产品的重量和尺寸选择举升工具（吊车或叉车）和吊装工具（链条和吊钩或皮带和绳索）。
- 请确保产品在运输过程中可靠固定。
- 产品在运输过程中做到轻取轻放，以免损坏。

3.2 存放

- 产品需要在防腐条件下进行保藏。
- 产品在通风的房间内存放其防锈蚀性能最长可保持供货后的12个月。
- 产品在空调房间内存放其防锈蚀性能最长可保持供货后的18个月。务必排除高湿度空气状态。

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4 安装

在安装之前必须备好以下文档：

- 产品的尺寸外形图。
- 产品的相关技术数据。
- 产品的使用说明书。

4.1 拆除包装

- 产品标准采用木质运输箱包装后供货。为了防止潮湿，供货采用防锈蚀膜包装并配有干燥袋。
- 拆卸产品包装时按以下步骤操作：
  1、请将包装置于一个平展、有足够承载力的地板上。
  2、务必从上面打开包装。
  3、检查供货是否有运输损坏以及是否完整。
  4、检查产品型号是否正确。
  5、用合适的举升工具和吊装工具将产品从包装中取出。
  6、将产品放置于合适的地方，防止倾倒。

⚠ 请根据您所在国家的相关规定对包装废品进行废处理。

4.2 安装条件

◆确认产品完好无损（在运输或储存过程中未损坏）。
◆确认现场环境条件与铭牌内容相符。
◆确保齿轮箱所有油口均进行密封保护处理，以防止油口污染。
◆在户外安装时应该避免阳光的直射，一定要避免热力集中影响齿轮箱和驱动单元的正常性能。
◆确保给齿轮箱留出足够活动空间以备以后进行维护保养和维修。
◆制造厂家对于不正确的组装和安装所造成的任何损伤概不负责。

标准产品：环境温度为-20℃~+50℃；无油、酸、有害气体、蒸汽、放射性物质等。

4.3 安装方位

◆齿轮箱的默认安装方位为竖直安装（小齿轮朝下），其余安装方位需事先声明。

4.4 安装说明

以下安装说明涵盖电机驱动、液压马达驱动和法兰安装形式（法兰A和法兰B），用户根据自己的产品类型确定合适的安装方法。

4.4.1 安装准备

◆清洁安装配合表面的防腐剂、污物等。
◆需要安装密封件（O型圈、油封等）时，请做好保护措施，防止密封件划伤、割伤。
◆若产品储存时间在一年以上，推荐在安装前更换液压油、润滑剂、润滑油等。
◆工具/材料的准备：扳手、扭矩扳手、装配夹具、输入和输出紧固装置、润滑剂(防锈油)、密封螺栓的介质(螺纹锁固剂)等。
◆确认齿轮箱的安装尺寸和安装机架连接尺寸一致。
◆不带驱动单元的齿轮箱需确认输入接口和驱动单元输出接口尺寸一致。
◆确认产品及其附件安装顺序。

4.4.2 吊装示意

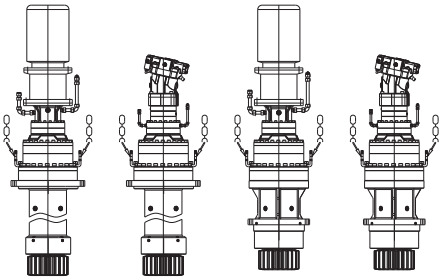

图3 齿轮箱吊装安装示意

⚠ ◆ 可根据齿轮箱实际重量，增加起吊点。

◆ 禁止使用轴端螺纹安装吊环后做为起吊点。

4.4.3 齿轮箱安装

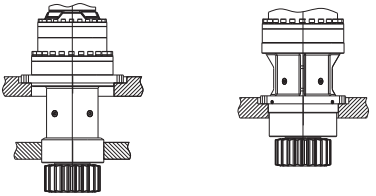

图4 齿轮箱与钢结构安装示意

齿轮箱输出法兰与钢结构连接螺栓强度等级必须为10.9级。

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4.4.4 液压马达安装

若是齿轮箱并不包含液压马达，请按以下步骤安装液压马达：

1、将液压马达用合适的吊装工具可靠地固定在起升设备上。并按图5所示方法运送到齿轮箱输入端。

图5 马达起吊示意

液压马达安装应根据马达种类不同，选择合适的吊装安装方法。

2、按照图6所示将0型圈放入输入法兰0型圈槽中。

3、双手扶住马达尾部，确保马达安装法兰面与减速机输入法兰面相平行，缓慢推入液压马达，至液压马达完全装入为止。

4、请使用强度等级至少为8.8级的螺栓将马达固定，固定螺栓不属于供货范围。

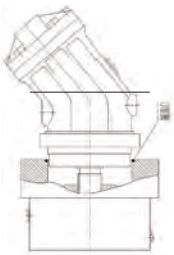

图6 法兰0型圈安装示意

◆ 安装过程中必须保证0型圈完好，如果0型圈划伤或者挤压变形，必须更换。

◆ 液压马达安装根据马达种类不同有所不同。

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4.4.5 将液压马达驱动齿轮箱接到液压系统

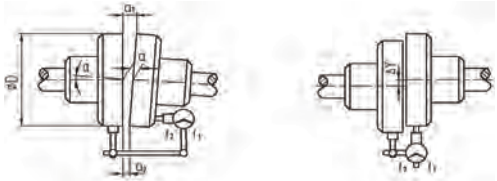
- 将马达A/B油口连接到主液压系统工作油路。
- 马达泄油口连接到主液压系统液压油箱。
- 将制动油口连接到制动器制动释放油口。

为保证齿轮箱正常工作，马达泄油口应直接接回油箱，如果无法接回油箱，必须确保马达泄油口背压均不超过1.5Bar。

4.4.6 电机安装

- 新安装或闲置三个月以上电机使用前必须进行安全性能检查。
- 安装联轴器或极限力矩限制联轴器时，务必调整好同轴度，同轴度误差大会增大机械振动，导致轴承过早破坏影响齿轮接触。
- 如图7所示，输入轴与驱动轴通过联轴器安装后，必须用表找正，有关检测参数推荐满足下表《同轴精度表》要求后，设备方可运行。
- 安装接线盒时确保做到清洁，不可进入液体、杂物。

电机存储环境湿度较大时，安装前对电机进行干燥处理.



角度偏差检测　　偏移检测

图7

同轴精度表

外径D	n<500r/min		500-1500r/min		>1500r/min	
	a1-a2	△Y	a1-a2	△Y	a1-a2	△Y
D≤100	0.05	0.05	0.04	0.04	0.03	0.03
100<D≤200	0.06	0.06	0.05	0.05	0.04	0.04
200<D≤400	0.12	0.10	0.10	0.08	0.08	0.06
400<D≤800	0.20	0.16	0.16	0.12	0.12	0.10

4.4.7 将电机驱动齿轮箱连接在电气系统上

◆将电动机连接到供电系统

◆将电磁、液压块式制动器连接到供电系统

◆ 确保制动器瓦块与制动轮表面无润滑油、润滑脂等介质。

◆ 电动机在接线前，先检查控制线路、保护电路是否正常，熔断器选用是否合适。

◆ 电动机机座应有专门的接地保护。

◆ 制动器应可靠接地。

4.4.8 安装完成

◆拆下所有安装辅助工具，如吊钩或工装。

◆请再次检查所有连接元件是否正确固定及其连接强度。

4.4.9 螺栓拧紧力矩

螺栓在摩擦系数为0.125时的拧紧力矩表

螺栓规格	螺栓强度等级8.8	螺栓强度等级10.9
M6	9.5 Nm	13 Nm
M8	23 Nm	32 Nm
M10	46 Nm	64 Nm
M12	80 Nm	110 Nm
M14	125 Nm	180 Nm
M16	195 Nm	275 Nm
M18	270 Nm	390 Nm
M20	385 Nm	540 Nm
M22	510 Nm	720 Nm
M24	660 Nm	930 Nm
M27	980 Nm	1400 Nm
M30	1350 Nm	1850 Nm
M36	2350 Nm	3300 Nm

5 调试

- ◆请务必按照相关技术数据进行调试，以免损坏设备。
- ◆调试前请确保所有电接口和液压接口已连接或封闭。
- ◆只有在产品安装完整的情况下方可进行。

5.1 齿轮箱加注润滑油

- ◆ 齿轮箱一般都未带润滑油出厂，在设备运行前，请先加入合适的润滑油。
- ◆ 润滑油液位应达到润滑硬管油镜中部。

表1 润滑油使用温度说明

环境温度	-20℃~+40℃	+30℃~+50℃
粘度牌号	VG220	VG320

- ◆ 环境温度低于-10℃时必须使用合成油。
- ◆ 为确保产品的使用寿命，实际使用中推荐使用合成油。
- ◆ 使用环境温度超过上述范围时，请咨询BONENG公司技术部门。

润滑油注油表，本表注油量为建议值。根据齿轮箱级数和速比的不同，相应加油量也不同。最终以油镜指示为准。

油 量 表 (L)												
	PS20	PS22	PS24	PS25	PS26	PS27	PS29	PS31	PS32	PS33	PS34	PS36
2	8	9	14	16	25	28	45	50	–	–	–	–
3	–	–	16	18	27	30	48	55	80	–	–	–
4	–	–	–	–	29	32	50	58	85	150	160	180

齿轮箱加注润滑油步骤如下：

1、拆掉齿轮箱输入端润滑硬管上侧油塞和通气帽，从油口注入润滑油。

2、待润滑油液面到达油镜中部并稳定后停止加油。

3、拧紧通气帽和油塞。

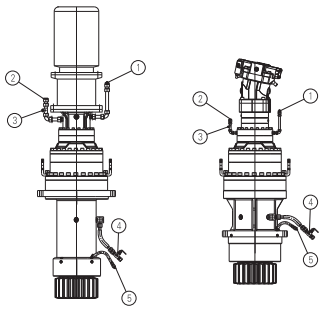


图8 齿轮箱油口示意

- ◆ 齿轮箱所有齿轮和滚动轴承均采用浸油润滑。
- ◆ 输出轴下端轴承采用润滑脂。

5.2 液压马达驱动齿轮箱调试

在调试齿轮箱之前必须备好以下文档:

- ◆齿轮箱的液压原理图
- ◆齿轮箱所在主机设备液压原理图
- ◆液压系统调试大纲

准备好压力表、测压线等测压附件，以便于记录卷扬机运行状况。

5.2.1 液压系统注油

- ◆为了防止齿轮箱液压元件损坏并保持功能正常，调试之前必须对马达壳体进行加液和排气。
- ◆通过过滤小车等加液设备加液（过滤器精度10μm）。齿轮箱在加液过程中不得运行。
- ◆通过马达壳体上侧泄油口（如图9所示T1口）进行注油，注满为止。

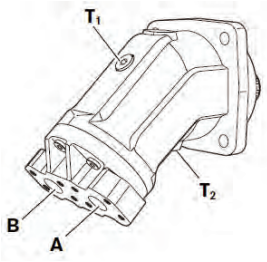
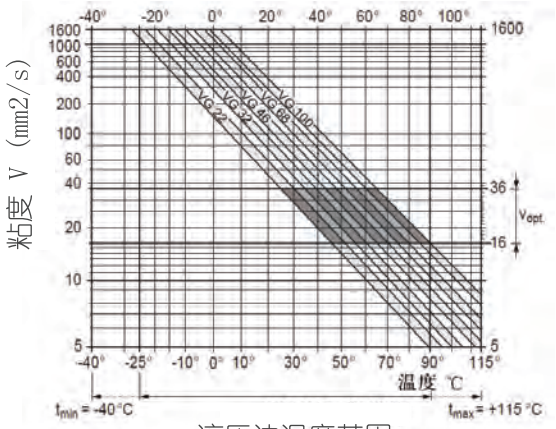


图9 马达油口示图

- ◆ 请务必使用矿物油基液压油。如果采用特殊液压油，需要进行技术确认。
- ◆ 为确保液压元件寿命，液压油的清洁度等级至少为ISO 4406规定的20/18/15级。当油温很高时（85℃至110℃），液压油清洁度等级至少为ISO 4406的19/17/14级。
- ◆ 根据不同的环境选择合适的液压油以保证设备的正常使用.冬天推荐使用液压油粘度等级VG32，对于温度很低的北方环境可使用液压油粘度等级VG22或者低温专用液压油。夏天推荐使用液压油粘度等级VG46，若室外环境温度很高则使用液压油粘度等级VG68。

图10所示为不同粘度等级液压油粘温特性，图中阴影部分为液压油最佳使用温度范围，用户可根据设备所处环境温度以及系统热平衡温度选择合适的液压油。



液压油温度范围

图10 液压油粘温特性

中文

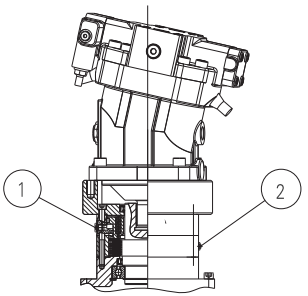
5.2.2 多片式制动器加注润滑油

◆ 制动器发运前内腔无油（除非特殊说明），用户应在使用前加油。

制动器加注润滑油步骤如下：

1、打开通过制动器上侧加油口。

2、加入润滑油（不同的制动器加油量不同，具体加油量请咨询 BONENG 技术）。



①驻车制动油口(M12×1.5) ②通气帽（加油）

⚠ 制动器只能用作驻车制动，不可用于动态制动。

5.2.3 试运行

- 试运行之前再次确认齿轮箱安装完成，测压附件均已连接。
- 若环境温度低于-10℃时，不建议直接冷启动齿轮箱，推荐用户先对液压油和齿轮箱润滑油进行加热，进行系统预热。
- 请先在空载的状态下运行齿轮箱一段时间，确保管路中排气完成。并检测液压系统运行状况。

5.3 电机驱动齿轮箱调试

- 电机的启动电流通常是运行电流的5~7 倍，连续启动次数不可以超过三次。
- 调试电机转向为所需转向。
- 调整电磁块式制动器两侧的瓦块退距，确保等距。
- 调整电磁块式制动器的制动扭矩到所需扭矩。

- 在调试齿轮箱之前准备好电气控制原理图
- 电机运行时正常外壳温度不超过80℃
- 确保电机风扇通风口空气流畅
- 电机运行时各相电流与平均值误差不超过10%
- 电机带载运行转速很低或者不转应立即断电。

中文

6 维护与维修

- 请按照本说明书所述定期进行规定的检修和维护作业。
- 通过定期护理、维护和检修可以延长产品的使用寿命。
- 产品的维修在质保期间只能由BONENG售后服务部门完成。如果在质保期内打开/改装/修改产品，将导致质保权利的丧失。

请将机器、设备停车，并在齿轮箱完全卸载的情况下进行检修/维护和维修作业。

6.1 清洁与护理

- 在对产品进行任何作业时请注意保持最高的洁净性。
- 请用合适的护罩和防护装置封闭所有开口，以防清洁剂进入系统。
  请使用无纤维织物的干燥布清洁油口。
- 如有杂物进入液压系统或者齿轮箱，请联系 BONENG
- 售后服务部门进行专业的拆检清洗，以免加剧液压元件和齿轮箱的磨损。

- 请勿使用高压清洁机清洁产品。
- 请勿使用侵蚀性的清洁剂或溶剂，以免腐蚀密封件。

6.2 检查

目检和声检是最直观有效的检查手段。

目检可以检查以下状况：

- 齿轮箱是否漏油。
- 液压系统是否密封完好。
- 齿轮箱油位是否正常。
- 齿轮箱各部分是否有过度磨损。

声检可以判断设备设备的运行状况：

- 如齿轮箱出现尖锐的鸣叫声，则表示齿轮箱出现损坏。
- 如液压马达出现较大的响声，则液压系统有可能出现吸空、油液中含有空气。
- 如电机运行时有较大的嗡嗡声，说明电流过大或者缺相运行。

6.3 维护计划

- 表1中所述的“齿轮箱的维护计划”仅适于行星齿轮箱。因此，请根据设备的维护规范制定行星齿轮箱的维护计划。
- 表2中所述的“液压系统及元件的维护计划”仅适于液压系统及元件。因此，请根据设备的维护规范制定液压系统及元件的维护计划。
- 表3中所述的“电气系统及元件的维护计划”仅适于电气系统及元件。因此，请根据设备的维护规范制定电气系统及元件的维护计划。

表1：齿轮箱的维护计划

条目	周期
检查油温	每日
检查油面高度	每日
检查齿轮箱的漏油	每月
检验油中的水分	200工作小时后，至少每年一次
在起动之后的首次换油	在200工作小时后
其后的换油	每年或者1000工作小时
清理通气帽	每3个月
检查紧固螺栓的紧固程度	第一次换油后，其后每隔一次换油
对于齿轮箱的全面检查	大约每 2 年和各换油同时进行

表2 液压系统及元件的维护计划

条目	周期
检查液压胶管、液压件油口接头是否存在渗漏油	每日
检查液压元件在工作中是否存在噪音	每周
检查多片式制动器工作时是否存在噪音	每周
多片式制动器润滑油更换	每2000小时
检查液压元件紧固螺栓的紧固程度	每三个月
更换滤芯	根据过滤器厂家周期或者当过滤器阻塞报警时
进行液压油分析：粘度、老化程度和污浊度	每年，最迟在2000个运行小时后

表3 电气系统及元件的维护计划

条目	周期
电机更换润滑脂	每半年
检查电气元件紧固螺栓的紧固程度	每3个月
检查制动器制动瓦退距是否相等	每3个月
更换制动器摩擦片	摩擦片厚度尺寸小于使用要求或烧坏
检查制动器主弹簧松紧力，以防溜钩	每3个月

6.4 维修

- ◆BONENG为您提供产品全面的维修服务。
- ◆在质保期内，产品必须由 BONENG 售后服务部门进行维修。如果在质保期内私自打开/改装/修改产品，将导致质保权利的丧失。
- ◆请务必使用 BONENG 原装的备件对产品进行维修，否则将无法确产品的功能安全性，您将丧失质保权利。

7 拆卸与拆换

- 您可以使用标准工具拆卸驱动单元。无需专用工具。
- 拆卸驱动单元时的不正确操作可能使驱动单元受损。
- 拆卸时请勿敲打产品。不可对驱动单元、齿轮箱外壳等核心部件施加轴向力。

  请确保产品在拆卸过程中做到轻拿轻放。

- 确保拆卸现场清洁，防止污物或异物进入液压系统和齿轮箱。
- 液压驱动齿轮箱在拆卸完成后必须将液压元件油口、管路接口封住，做保护处理。

⚠ 回收拆卸现场的油液、润滑剂等油类介质。

⚠ 必须在齿轮箱停机、卸载并冷却后进行拆卸。

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8 故障查询与故障排除

以下故障表可以帮助您查找到故障。我们不担保表中内容的完整性，实际应用中可能出现这里未涉及的问题。

- ◆ 表4为行星回转齿轮箱故障表
- ◆ 表5为液压系统及元件故障表
- ◆ 表6为电气系统及元件故障表

- ◆ 必要时仔细记录发生故障时设备的运行情况，并将信息及时反映给 BONENG 售后服务部门。
- ◆ 如果所发生的故障不包含在上述表中，或者无法排除故障，请及时联系BONENG售后服务部门

表4 行星回转齿轮箱故障表

故障	可能的原因	排除方法
齿轮机构声音有变化	齿轮受损	1. 检查所有齿轮零部件是否有损坏。 2. 让 BONENG 售后服务部门更换受损的零部件。
	轴承出现间隙	通知客服
	轴承损坏	
噪音	紧固件松动	将螺栓拧紧到规定扭矩
齿轮箱温度明显高于正常温度	油位过高或过低	1. 让行星齿轮机构冷却。 2. 请检查油位。 3. 补充润滑油或在油位过高时排放一些。
	润滑油过于老化或严重污染	检查设备、机器或车辆的使用手册，查看何时换油，必要时换油
漏油	输入端油封损坏	检查密封件，如有可能在必要时进行更换。 如果无法排除漏油，必须通知客服
	输出端油封件受损	
润滑油起泡	所加注的润滑油与行星齿轮机构中剩余的油或防腐润滑油不匹配	更换润滑油并用合适的冲刷油进行彻底地冲刷

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表5 液压系统及元件故障表

故障	可能的原因	排除方法
马达与制动器安装面漏油	0型密封圈损坏	更换
软管接头处渗油	密封件损坏	更换
运行时制动器异响	制动器开启减压阀设定压力过低	测量马达集成块制动口压力
	制动器损坏	维修/更换
马达运行时出现异响	马达吸空	测量马达集成块补油口压力
	马达损坏	维修/更换
	缓冲阀设定压力过低	重新设定缓冲阀压力
	马达损坏	维修/更换
马达与马达集成阀块安装面漏油	0型密封圈损坏	更换
	马达集成阀块安装面损坏	维修/更换

表6 电气系统及元件故障表

故障	可能的原因	排除方法
电机无法启动	保险丝熔断	更换保险丝
	定子线圈接触不良	打开终端盒，用测试灯确定连接不良的部位
	电机可能处于过载状态	降低启动负载
	主电源线路故障	检查电源线路
电机转速慢	线路电压降低而导致电机接线端子电压过低	使用更高的压力功率或使用电压互感器
	主电路断路、缺相	检查电路是否正常并连接完好
电机振动	支座不稳	加固底座
	联轴器错位	重新平衡联轴器
电机异常响声	轴承损坏	更换
电磁块式制动器制动时声音尖锐	制动衬套磨损严重	更换
制动器无法可靠制动	制动弹簧松动或损坏	维修/更换
制动器打不开	制动弹簧过紧	调整弹簧松紧度

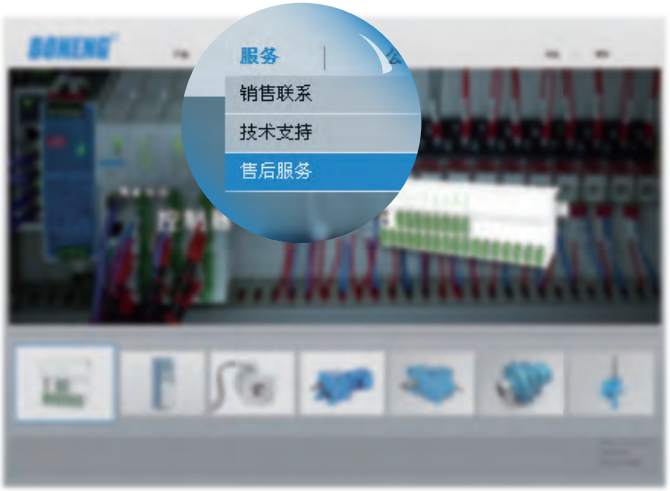
中文

售后服务

售后服务请按以下步骤提交售后流程。

→ 登录“www.boneng.com”

→ 点击“服务”和“售后服务”



→ 登录系统

其他地区

控制器/驱动器 ： 0512-66182005

马达/齿轮马达/齿轮箱 ： 0512-66189918

博能传动（沈阳）有限公司
控制器/驱动器 ： 024-31271571
马达/齿轮马达/齿轮箱 ： 024-31292571

博能传动（天津）有限公司
控制器/驱动器 ： 022-86928559
马达/齿轮马达/齿轮箱 ： 022-26929558

博能传动（开封）有限公司
控制器/驱动器 ： 0371-23335230
马达/齿轮马达/齿轮箱 ： 0371-23277771

博能传动（潍坊）有限公司
控制器/驱动器 ： 0536-4699687
马达/齿轮马达/齿轮箱 ： 0536-4699667

博能传动（长沙）有限公司
控制器/驱动器 ： 0731-88386958
马达/齿轮马达/齿轮箱 ： 0731-88380725

博能传动设备（成都）有限公司
控制器/驱动器 ： 028-87740066
马达/齿轮马达/齿轮箱 ： 028-87740066

博能传动（肇庆）有限公司
控制器/驱动器 ： 0757-86719757
马达/齿轮马达/齿轮箱 ： 0758-2699830

博能传动（苏州）有限公司
控制器/驱动器 苏南区：0512-66182005
马达/齿轮马达/齿轮箱 苏南区：0512-66189918
控制器/驱动器 浙沪区：0512-66182005
马达/齿轮马达/齿轮箱 浙沪区：0512-66189918
控制器/驱动器 苏皖区：0512-66182005
马达/齿轮马达/齿轮箱 苏皖区：025-52171612

博能传动（美国）有限公司
技术支持/调试/售后服务：
1250 E 222nd Euclid, OH 44117,United Staes
Email: America@boneng.com
Tel: 1-216-618-3099/1-216-618-0138

博能传动（印度）有限公司
技术支持/调试/售后服务：
Plot No. E-10/3,MIDC sinnar(Malegaon)Industrial Area, Nashik, 422123, Maharashtra, India.
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Important notes

During installation, please pay attention to the safety notes and warning in this book!

	Electricity danger Possible result: death or serious injury
	Dangerous situations Possible result: minor injury
	Harmful situations: Possible result: damage transmission device and the environment
	Application suggestions and useful information

- If you conform to the regulations in this manual,there won’ t be any fault,at the same time,it can satisfy the requirements of quality defect claim. So before the transmission device starts working,please read this instuction.
- This instruction book contains important installation and maintenance notes,please keep this instruction book in a place near the device for reference.

EN

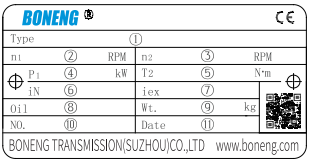
1 Safety information

Safety information mainly involve the applications of gearbox. When running gearbox, please note the relevant notes.

- This instruction is an integral part of the gearbox supplied.
- All persons involved in the installation, operation, maintance and repair of the gearbox must have read the instructions and comply with them.
- Conforming to the instruction strictly is a necessity for realizing non-fault running and performing any quality assurance requirement.
- Under the premise of conforming to instruction, please pay attention to:
  →National (Local) regulations for relevant safety and accident preventions;
  →Special regulations and requirements of relevant devices;
  →Warning and safety mark on device.
- The following situations will cause human injury and property loss:
  →Incorrect running;
  →Wrong installation or operation;
  →Dismatle the protect cover or housing against the instructions.
- Any damage or stop caused by disregarding this instruction book will not be responsible by the company.
- To seek for technical advance, we reserve the rights to modify the instructions. With continuous improvements, we will further improve its performance and safety performances on the foundation of keeping the basic characteristics.

2 Technical information

2.1 The name plate information

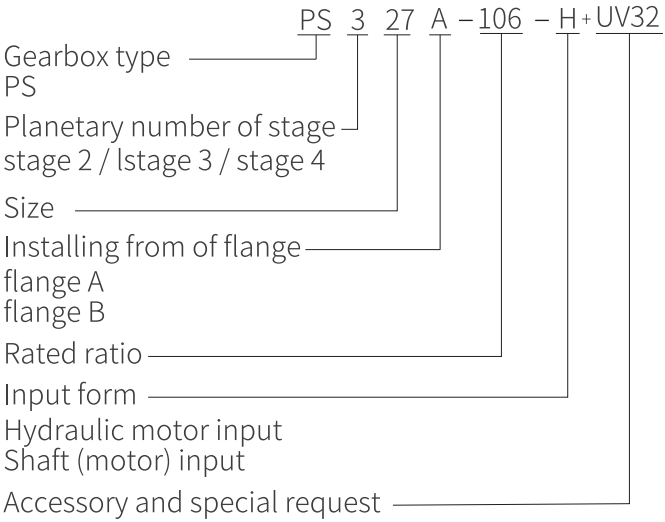


Data on nameplate are very important, please read them carefully and keep them clean. When services are needed, please provide the product number, used time and fault details.

①Product type
②Rated input speed(it means motor speed for directly connected motor)
③Output speed (only for directly connected motor)
④Rated input power(it means motor power for directly connected motor)
⑤Rated output torque
⑥Nominal speed ratio
⑦Accurate speed ratio
⑧Lubrication oil viscosity
⑨Weight
⑩Product number
⑪Production date

EN

2.2 Gear unit type description



2.3 Feature description

- The rated output torque for PS is 11000N.m-590000N.m. For the specific product feature date, please refer the catalogue or BONENG relative technical material.

2.4 Products description

- PS planetary rotary gear units are incorporated with built in planetary gear units, drive units, output pinion and other relative accessories. It is used on rotary driving mechanism of port crane, Lorry-mounted crane and mobile crane, building crane, deck crane, container gantry crane, cars and crawler crane, offshore platform crane etc.

2.4.1 Gear units

- PS gear units with big output torque, large range of ratio and stability.
- The sun gear and planetary gear material are excellent alloy steel which is carburized and quenched, internal gear material is excellent alloy steel which surface is hardened, all the gears are grinded.
- Planetary rack and the middle connect flange material are nodular cast iron which has high loading force.

2.4.2 Drive unit

- The PS drive unit is motor or hydraulic motor（see figure 1 and 2）.

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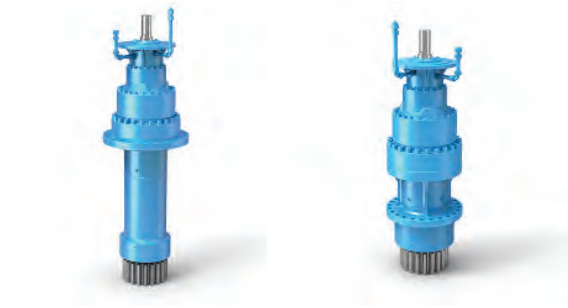

Figure 1 motor drive

Figure 2 hydraulic motor drive

2.5 Notes

- Any change on the rotary gear unit is prohibited. The adverse consequences caused are not within warranty scope.
- Any welding on the gear unit is forbidden. And can’ t make the gear unit as the welding site, it will damage the precision gear and bearings etc.
- Any abnormity happened (For example, Higher temperature or abnormal noise), stop the gear unit immediately and check the fault and solve it.
- Make sure use all the original spare parts from BONENG, which can avoid accident by in appropriate spare parts.

⚠ If need get the oil sample or drain out the oil lubrication, please open the oil outlet carefully to avoid the oil spray or spill out.

⚠ Only the gear unit is stopped, dismantle work can be done.

EN

3 Transportation and storage

Before transport, please read the instruction carefully and comply with them to stock the gear units.

3.1 Transportation

- Comply with the local Country transport law and rules.
- When lifting by hoist or forklift, must be done by the qualified person.
- According to the weight and measurement, choose the correct lifting tool (hoist or forklift) and lifting tools (chain and hook or belt and rope).
- During transport, make sure it is fixed well.
- When transporting, make sure lift and put down lightly to avoid damage.

3.2 Storage

- Gear units should be stocked in anti-corrosive condition.
- Gear units should be stocked in good ventilation and anti-rust environment. It will be kept well for 12 months.
- If stocked in air condition, the anti-rust can be kept for 18 months. Keep away from the humid place.

4 Assembly

Before assembly, prepare following material,

- Products overall dimension drawing.
- Products technical data.
- Products operation instructions.

4.1 Remove the packaging

- The standard packing is wooden case. To avoid the damp, the internal pack is with anti-rust film and the dryer.
- Follow the steps to remove the packaging.
  1.Put the packaging on a certain loading and explanate place
  2.Open the package from up side
  3.Check the package surface
  4.Check the gear unit type
  5.Use the suitable lifting tool to fetch the gear unit out
  6.Put the gear unit to available place and avoid leaning.

⚠ Do the packaging disposal as the local law.

EN

4.2 Assembly condition

- Confirm the products in good condition (No damage during transporting or stock).
- Confirm the coordinate of site condition with the name plate.
- Make sure the oil inlet and outlet is sealed well to avoid pollution.
- When installing outdoors, direct sunshine should be avoided. Otherwise the heat concentration will affect the gear units performance.
- Keep certain place for the maintenance and repair.
- Any damage caused by incorrect assembly will not be protected by BONENG.

Standard products: ambient temperature:-20°C -+50°C, no oil, acid, harmful gas, steam, radiomaterial .

4.3 Mounting position

- The acquiescent installation location of gearbox is vertical installation (the pinion is downward). Other installation location need be instructed in advance.

4.4 Assembly description

Following assemble instructions include the motor drive, hydraulic motor drive and the flange installation (Flange A and Flange B). Customer assembles your gear units.

4.4.1 Assembly prepare

- Clean the mounting surface.
- When mounting the sealing (O type sealing or oil sealing), take measure to avoid scratch it.
- When the gear units are stocked over 1 year, change the oil, lubrication and oil lubrication etc before mounting.
- Tools: wrench, wrench torque, work piece, input and output fasten device, lubrication (anti-rust oil), screw sealing (screw glue).
- Make sure the winch gear unit mounting size is the same as the mount support connection.
- If there is no input drive for gear unit, confirm the input size of the gear unit is the same as the output size of the drive units.
- Confirm the mounting sequence of the spare parts.

4.4.2 Hoisting schematic drawing

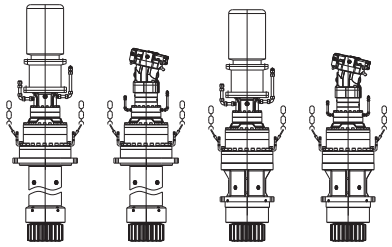

Figure 3 Hoisting installation schematic drawing of gear box

- Increase lifting points according to the weight of gear units.
- Forbid the shaft end thread with flying rings as lifting points.

4.4.3 Gear box installation

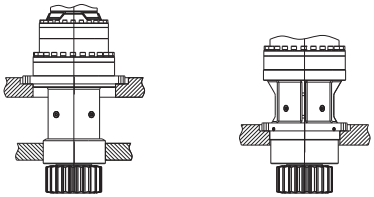

Figure 4 Installation instruction of gearbox and steel structure.

When the output flange of gear units connect with the steel structure, the screw level must be 10.9

4.4.4 Hydraulic motor mounting

If the gear unit is exclusive the hydraulic motor, assemble the hydraulic motor as followings:
1.Lift the hydraulic motor and fix it on the hoisting tools. Transfer it to the input part of gear unit according figure 5.

Figure 5 motor lifting

Choose suitable hoisting installation methods according to the different varieties of hydraulic motors.

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2.Put O ring into the O ring groove of input flange as figure 6
3.Hold the end of motor by hands to make sure the flange face is on the same level with the input flange face of gear unit and then push the hydraulic motor into the input flange of gear unit.
4.Use 8.8 tighten level screw to fix the motor. The screw supplied by customer.

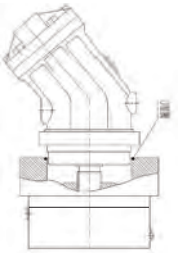


Figure 6: flange O ring mounting

- Must keep the O ring perfect during assembly, if there is scratch or crush, replace the new one.
- Choose suitable installation methods according to the different varieties of hydraulic motors.

4.4.5 Connect the hydraulic motor gear unit with the hydraulic system

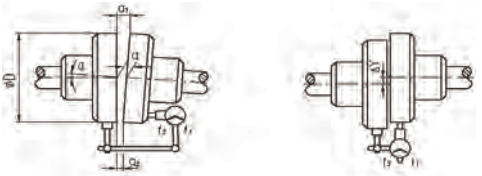
- Connect the A/B oil port of the motor with the oil system of the main hydraulic device.
- Connect the oil outlet of the motor with the oil tank of hydraulic system.
- Connect the brake oil port with the brake release oil port of the brake.

To make sure the gear unit run well, the oil outlet of motor should connect with the oil tank directly, if not, must make sure the pressure of the motor is not more than 1.5 Bar.

4.4.6 Motor mounting

- For the new assembled or stocked over 3 months motor, must check the safety before using.
  When assemble the coupling or limiting torque coupling, must align the coaxiality. Big coaxial tolerance will cause the vibrations which will damage the bearings and the mesh of gears.
  When the motor shaft connect with the input shaft of gear unit by coupling (figure 7), must align the level by meter and meet the following data showed in" the coaxial precision table".
  When connect the box terminal, must keep it clean, no liquid or waste.

If the stock environment for motor is very moist, dry the motor before mounting.



Angular deflection test　　deviation test

Figure7

The coaxial precision table

Outer diameter/O.D	n<500r/min		500–1500r/min		>1500r/min	
	a1-a2	△Y	a1-a2	△Y	a1-a2	△Y
D≤100	0.05	0.05	0.04	0.04	0.03	0.03
100<D≤200	0.06	0.06	0.05	0.05	0.04	0.04
200<D≤400	0.12	0.10	0.10	0.08	0.08	0.06
400<D≤800	0.20	0.16	0.16	0.12	0.12	0.10

4.4.7 Connect the motor drive gear unit with the electric system

- Connect the motor with the electric system.
- Connect the electromagnetic and hydraulic brake with the electric system.

- Confirm no oil or lubrication grease on the brake block and the brake wheel.
- Check the wire, protective circuit and fuse plug before connecting the motor.

- Special earth protector should be done for motor base.
- Brake should do safe earth connection.

EN

4.4.8 Assembly completed

- Remove all tools, such as hooks and work piece.
- Recheck all the connection units correct fixed and tightened.

4.4.9 Screw tighten torque

When the friction factor is 0.125, the screw tighten torque is showed as following table.

Screw type	Screw strength8.8	Screw strength10.9
M6	9.5 Nm	13 Nm
M8	23 Nm	32 Nm
M10	46 Nm	64 Nm
M12	80 Nm	110 Nm
M14	125 Nm	180 Nm
M16	195 Nm	275 Nm
M18	270 Nm	390 Nm
M20	385 Nm	540 Nm
M22	510 Nm	720 Nm
M24	660 Nm	930 Nm
M27	980 Nm	1400 Nm
M30	1350 Nm	1850 Nm
M36	2350 Nm	3300 Nm

5 Debugging

- Test according to the relative technical data to avoid the damage.
- Before debugging, make sure all the connections for electric or hydraulic are done or closed.
- Do debugging till all assembly work finished.

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5.1 Fill the lubrication in gearbox

- The gearbox are out of lubrication before delivery, please fill the oil lubrication before running.
- The oil level should be on the middle of the oil glass.

Table 1: Lubrication

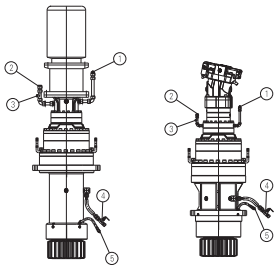
Ambient temperature	-20°C~+40°C	+30°C~+50°C
Adhesiveness of oil brand	VG220	VG320

- When ambient temperature is lower than -10°C, use synthetic oil only.
- To length the gear unit life, suggest to use synthetic oil.
  When ambient temperature is over the range of the table, please consult BONENG technical department.

Oil quantity table: this is the suggest value. Different stage and ratio, the oil quantity is different. Fill the oil according to the oil glass level.

Oil Level (L)												
	PS20	PS22	PS24	PS25	PS26	PS27	PS29	PS31	PS32	PS33	PS34	PS36
2	8	9	14	16	25	28	45	50	–	–	–	–
3	–	–	16	18	27	30	48	55	80	–	–	–
4	–	–	–	–	29	32	50	58	85	150	160	180

The step of filling oil is as followings,
1.Remove the oil plug and breather on the top of the lubrication tube on the input part, and fill the oil from the oil port.
2.Stop filling the oil when the lubrication oil level on the middle of the oil glass.
3.Tighten the breather.



①Breather
②Oil plug (oiling)
③Oil glass
④Ball valve(oil drainage)
⑤Grease fitting(greasing)

Figure 8: the oil port structure

- All gears and rolling bearings in gearbox are with immersion oil lubrication.
- The bearings under the input shaft are with grease.

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5.2 The debugging for the hydraulic motor gear unit

Prepare following documents before debugging

- The gear unit hydraulic principle diagram.
- The driven machine hydraulic principle diagram.
- The outline for hydraulic system.

Prepare the pressure meter and pressure test line to record the gear unit running.

5.2.1 Filling oil for hydraulic system

- To prevent the gear unit hydraulic parts, please fill the oil and draw the air out on motor housing before debugging.
- Fill the oil by the filter car (filter precession is 10μm). Running is not allowed when filling oil.
- Fill the oil through the upper oil inlet on the motor housing (see figure 9 T1) with full.

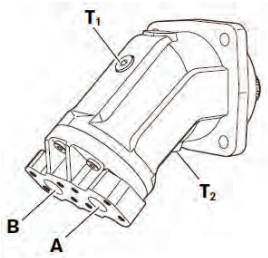

Figure 9 motor oil inlet

- Must use mineral oil. If need use special oil, must get the approval from BONENG technician.
- For the sake of hydraulic unit life, the oil cleanliness level should be kept above 20/18/15 stipulated in ISO 4406. When oil temperature is very high (85°C-110°C), the cleanliness for the oil should be kept above 19/17/14 as ISO 4406 stipulated.
- Choose suitable lubrication oil to make sure the gear unit running well if the temperature is different. Suggest use VG32 in winter, for very low temperature, suggest use VG22 or special oil for the lower temperature. And suggest use VG46 in summer. If the outside temperature is very high, suggest use VG68.

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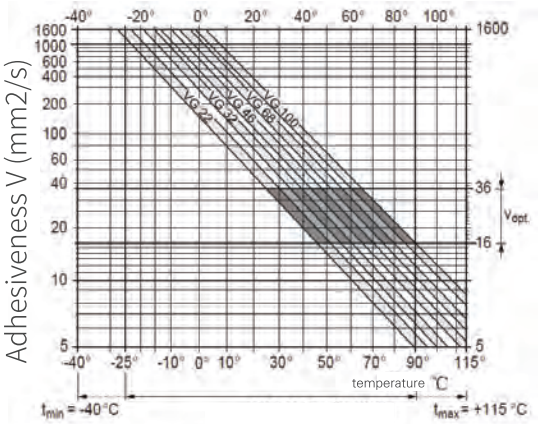
Suggest the oil adhesiveness and brand in figure 10, the part with shadow is the best temperature for the relative oil brand. Customer can choose the suitable oil brand according to the ambient temperature and machine average temperature.

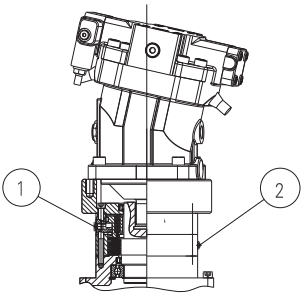


Oil temperature range

Figure 10 oil adhesiveness

5.2.2 Filling oil for multi piece brake

- Brake is out of lubrication before delivery, please fill the oil lubrication before running.
  The steps for filling the oil on brake,
  1.Open the oil inlet upper on the brake,
  2.Filling the oil (Different brake will fill different oil level, for exact oil level, please consult BONENG technical department)



①Parking brake oil mouth(M12×1.5) ②Breather(oiling)

Brake is used for parking brake and not allowed to use for dynamic brake.

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5.2.3 Running test

- Make sure the gear unit assembly completed and all the pressure testing accessories are connected well before running test.
- When temperature is lower -10°C，suggest heat the hydraulic oil and lubrication oil of gear units first then start up the gear unit.
- Running the gear unit for some times without loading to make sure all the air in the tube is exhausted. And check the pressure system to operate well.

5.3 Motor drive gear unit debugging

- The motor starting electric current is 5 to 7 times than operating current, the continuous starting times is not more than 3.
- Adjust the motor rotation as required.
- Adjust the distance on the electromagnetic brake pad and keep the same distance.
- Adjust the brake torque of the electromagnetic brake as required.

- Prepare the electric control principle diagram before debugging.
- During motor operating, the housing surface temperature is not over 80°C.
- Make sure the motor fan ventilate well.
- The tolerance of current and average on phase is not exceeded of 10% during motor operating.
- Switch off the motor immediately when the motor rotor speed is very low or not run with loading.

6 Maintenance and repair

- Maintenance should be made periodically as this instruction.
- Lengthen the gear unit life through the periodical maintenance and repair.
- The after sales service person of BONENG will do the repair during the quality warranty. The quality warranty will be invalid if customer dismantle, change or repair the gear unit during warranty period.

Do the maintenance and repair only when machine and equipments are stopped and the gear unit is dismantled completely.

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6.1 Clean and maintenance

- Keep the winch gear unit clean and make sure the gear unit to work normally.
- Using the suitable cover and protect device to seal all the ports to prevent the cleaner to enter into the system.
- Clean the oil port using dry cotton fabric.
- If the raffle penetrates into the hydraulic system or gear unit, please contact BONENG after sales service and we will do the special washing to avoid damage the hydraulic unit and gear unit.

- Jetting machine is forbidden to clean the hoist gear unit.
- Corrosive cleaner or solvent is not allowed.

6.2 Checking

- Checked by eyes and sound are the best way.
- Following situation can be checked by eyes.
- The oil leakage from winch gear unit.
- Well sealing on hydraulic system.
- Normal oil level on gear unit.
- No over abrasion on the part of gear units.
- Following situation can be checked by sound.
- If there is harsh noise, it shows the gear unit damaged.
- If there is big noise from hydraulic motor, it shows the hydraulic system is sucking air and there is air in the lubrication oil.
- If there is big hum when motor operating, it shows the electric current is big or operate with default phase.

6.3 Maintenance plan

- Table1 “Gear units maintenance plan” is only suitable for planetary gear unit. Please do the planetary gear unit maintenance plan as the equipment maintenance rules.
- Table2 “Hydraulic system and accessories maintenance plan” is only suitable for hydraulic system and accessories. Please do the hydraulic system and accessories maintenance plan as the equipment maintenance rules.
- Table3 “Electric system and accessories maintenance plan” is only suitable for electric system and accessories. Please do the electric system and accessories maintenance plan as the equipment maintenance rules.

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Table 1 Gear units maintenance plan

Measures	Periods
Check oil temperature	Daily
Check oil level	Daily
Check gear unit for leaks	Monthly
Test oil for water content	200 operating hours following start-up
First oil change	200 operating hours following start-up
Subsequent oil changes	Every year or 1000 operating hours
Clean the breather	Every 3 months
Check tightness of fastening bolts	After first oil change, thereafter, after every second oil change
Carry out complete inspection of gear unit	Approx. every 2 years simultaneously with due oil change

Table2 Hydraulic system and accessories maintenance plan

Measures	Periods
Check the hydraulic hose, oil port connection for leaks	Daily
Check the noise during the hydraulic accessories working	Weekly
Check the noise during the multiple disc brake working	Weekly
Change the lubrication oil for the multiple disc brake	Every 2000 hours
Check tightness of fastening bolts for the hydraulic accessories	Every 3 months
Change the filter element	According to the filter period or the alarm from filter
Analysis the oil: adhesive, degree of aging and muddiness	After 2000 operating hours once per year at least

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Table 3 Electric system and accessories maintenance plan

Measures	Periods
Change the grease for motor	Every 6 months
Check tightness of fastening bolts for electric accessories	Every 3 months
Check the same distance on the brake pad	Every 3 months
Change the brake friction plate	The thickness for the brake friction is lower than the stipulated or be burned
Check tightness of main spring for brake	Every 3 months

6.4 Repair

- Boneng will offer the complete service for the winch gear units.
- During warranty, repaired working should be done by the after sales service of Boneng. If dismantle the gear units/ change/ alter the product by self, the quality guarantee will be invalid.
- Must use the original spare parts from Boneng for repair.

7 Dismantling and replace

- Use the standard tools to dismantle the drive unit, special tools are not needed.
- Incorrect operating will hurt the drive units.
- Hitting products is forbidden when dismantle. No shaft force or high pressure on the core parts of drive units and the housing of gear units.
- Handle the products lightly during dismantle.

- Keep the dismantle spot is clean and keep the contaminant away from the hydraulic system and gear units.
- After dismantle on the hydraulic driving gear unit, must keep the hydraulic unit oil port and tube connection sealed and protect them.

⚠ Recycle the oil and lubrication etc.

⚠ Do the dismantle working only after the gear units stopping, no loading and cooling down.

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8 Faults checking and resolve

Following faults checking table will help you to find the reason. We can’ t make sure it is complete, in fact, there may be the reason excluded in the table.

- Table 4 planetary rotary gear units fault.
- Table 5 hydraulic system and unit fault.
- Table 6 electric system and unit fault.

- Record the fault problem and send the information to customer service of Boneng in time.
- If the faults are not found in above table, and can’ t find the problem, please contact the customer service of Boneng.

Table 4 planetary rotary gear units fault

Malfunctions	Causes	Remedy
Changes in gear unit noise	Damage to gear teeth	1.Check all teeth 2.Replace any damaged parts
	Excessive bearing play	Contact customer service
	Bearing defective	
Loud noises	Fastening is loose	Tighten bolts/nuts to prescribed torque
Operating temperature too high	Oil level in gear unit housing too high or too low	1.Cooling the planetary gear units. 2.Check oil level 3.Filling more oil or drain out some oil if the level is too high
	Oil too old or badly contaminated	Check date of last oil change. And change the oil if necessary. Do it as the state on 6.4.2
Oil leakage	Output sealing defective	Check the sealings, if necessary, replace seals. If can’ t confirm the problem, contact customer service.
	Input sealing defective	
Oil foams	The new filled oil is not matched with the remained oil in the gear units	Clean the oil and change the new oil.

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Table 5 hydraulic system and unit fault.

Malfunctions	Causes	Remedy
Oil leakage on the connection of motor and brake	O type sealing rings defective	Change the seals
Oil leakage on the connection of hose	Sealing rings defective	Change the seals
Brake noise when gear unit operating	The pressure on the reducing valve is too low	Check the brake pressure on motor integrate block
	Brake damaged	Repair/change
Noise when motor operating	Motor sucks air	Check the oil port pressure on motor integrate
	Motor defective	Repair/change
	Cushion valve pressure is too low	Change the seals
	Motor defective	Repair/change
Oil leakage from the mounting face of motor and motor integrate block	O type sealing rings defective	Change the seals
	The mounting face of motor integrate block is damaged	Repair/change

Table 6 electric system and unit fault

Malfunctions	Causes	Remedy
Motor doesn’t run	Fuse burn out	Change the fuse
	Bad contact on stator coil	Open terminal box and test the bad contact point with testing light
	Motor may be with over loading	Reduce the load
	Main wire defective	Check the electric wire
Motor rote speed is slow	Electric pressure is low	Use the more higher pressure power or use the voltage transformer
	Main circuit break, default phase	Check the electric wire connection
Motor vibration	Support base is unstable	Fasten the support base
	Coupling position is incorrect	Correct the coupling position
Abnormal noise from motor	Bearing defective	Change
Loud noise from the magnetic block brake	Brake bush is badly worn	Change
Brake bad	Brake spring is loose or damaged	Repair/change
Brake can’t work	Brake spring is too tight	Adjust the spring tightness

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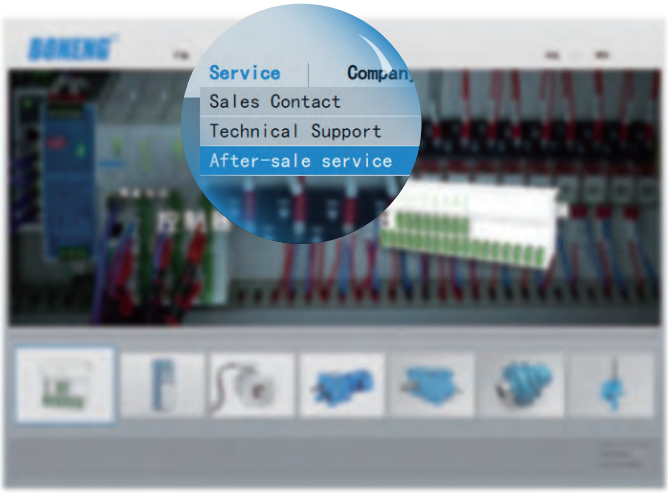
After–sale service

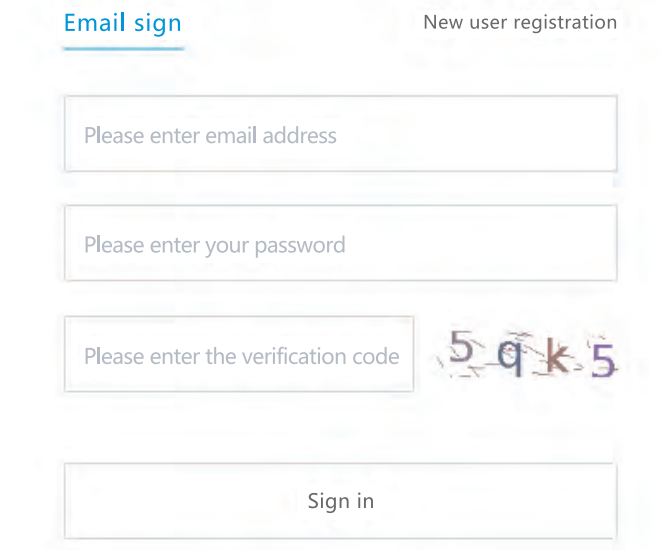
After-sales Service Please follow the steps below to submit the after-sales process.

→ Login “www.boneng.com”

→ Click “Service” and “After-sale Service”



→ Login system



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Other District

Controller/Drive : 0512–66182005

Motor/Gear motor/Gearbox : 0512–66189918

BONENG TRANSMISSION(SHEN YANG)CO.,LTD
Controller/Drive : 024–31271571
Motor/Gear motor/Gearbox : 024–31292571

BONENG TRANSMISSION(TIAN JIN)CO.,LTD
Controller/Drive : 022–86928559
Motor/Gear motor/Gearbox : 022–26929558

BONENG TRANSMISSION(KAIFENG)CO.,LTD
Controller/Drive : 0371–23335230
Motor/Gear motor/Gearbox : 0371–23277771

BONENG TRANSMISSION(WEIFANG)CO.,LTD
Controller/Drive : 0536–4699687
Motor/Gear motor/Gearbox : 0536–4699667

BONENG TRANSMISSION(CHANGSHA)CO.,LTD
Controller/Drive : 0731–88386958
Motor/Gear motor/Gearbox : 0731–88380725

BONENG TRANSMISSION EQUIPMENT (CHENGDU)CO.,LTD
Controller/Drive : 028–87740066
Motor/Gear motor/Gearbox : 028–87740066

BONENG TRANSMISSION(ZHAOQING)CO.,LTD
Controller/Drive : 0757–86719757
Motor/Gear motor/Gearbox : 0758–2699830

BONENG TRANSMISSION(SUZHOU)CO.,LTD
Controller/Drive Southern Jiangsu : 0512-66182005
Motor/Gear motor/Gearbox Southern Jiangsu : 0512–66189918
Controller/Drive Zhejiang-Shanghai : 0512-66182005
Motor/Gear motor/Gearbox Zhejiang-Shanghai : 0512-66189918
Controller/Drive Jiangsu-Anhui District : 0512-66182005
Motor/Gear motor/Gearbox Jiangsu-Anhui : 025-52171612

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