

# Wilo Motor T 12 ... 72 + EMU FA, Rexa SUPRA, Rexa SOLID



zh-CHS 安装及操作说明

en Installation and operating instructions



Chinese (simplified).....	4
English .....	57



WILO186739

## 目录

<b>1</b>	<b>概述</b>	<b>6</b>
1.1	关于本说明书	6
1.2	版权	6
1.3	保留更改权力	6
1.4	质量保证	6
<b>2</b>	<b>安全</b>	<b>6</b>
2.1	安全说明的标识	6
2.2	工作人员资格鉴定	8
2.3	电气作业	8
2.4	监控装置	8
2.5	在危害健康的介质内使用	8
2.6	运输	8
2.7	安装/拆卸工作	9
2.8	运行期间	9
2.9	维护工作	9
2.10	工作介质	10
2.11	运营者的责任	10
<b>3</b>	<b>应用/使用</b>	<b>10</b>
3.1	规定用途	10
3.2	未按规定使用	10
<b>4</b>	<b>产品说明</b>	<b>10</b>
4.1	结构	10
4.2	监控设备	13
4.3	运行模式	13
4.4	使用变频器运行	14
4.5	在易爆环境中运行	14
4.6	铭牌	15
4.7	型号代码	16
4.8	供货范围	17
4.9	附件	17
<b>5</b>	<b>运输和存放</b>	<b>17</b>
5.1	交货	17
5.2	运输	17
5.3	存放	18
<b>6</b>	<b>安装及电气连接</b>	<b>19</b>
6.1	工作人员资格鉴定	19
6.2	安装方式	19
6.3	运营者的责任	19
6.4	安装	19
6.5	电气连接	27
<b>7</b>	<b>试运行</b>	<b>31</b>
7.1	工作人员资格鉴定	31
7.2	运营者的责任	31
7.3	旋转方向监控 (仅限三相交流电机)	31
7.4	在易爆环境中运行	32
7.5	接通前	33
7.6	接通和关闭	33
7.7	运行期间	34
<b>8</b>	<b>停止运行/拆卸</b>	<b>35</b>
8.1	工作人员资格鉴定	35
8.2	运营者的责任	35
8.3	停止运行	35
8.4	拆卸	35

<b>9</b>	<b>维护和维修</b>	<b>37</b>
9.1	工作人员资格鉴定	37
9.2	运营者的责任	37
9.3	螺旋塞的字样	38
9.4	工作介质	38
9.5	维护间隔	38
9.6	维护措施	39
9.7	维修工作	46
<b>10</b>	<b>故障、原因和排除方法</b>	<b>49</b>
<b>11</b>	<b>备件</b>	<b>51</b>
<b>12</b>	<b>废弃处置</b>	<b>51</b>
12.1	油和润滑剂	51
12.2	防护服	51
12.3	关于收集损耗的电气产品和电子产品的相关信息	51
<b>13</b>	<b>附件</b>	<b>52</b>
13.1	拧紧扭矩	52
13.2	使用变频器运行	52
13.3	防爆认证	53

## 1 概述

### 1.1 关于本说明书

本安装及操作说明书是产品的固定组成部分。开始操作之前，请先阅读说明书并将其妥善保存在方便易取之处。严格遵守说明书中列出的要求和操作步骤，是按规定使用及正确操作产品的前提条件。另外注意遵守产品上标注的所有参数和标识。

原版操作说明书以德语撰写。所有其它语种的说明书均为其翻译件。

### 1.2 版权

安装及操作说明的版权归生产商所有。未经允许，禁止对其中的内容进行复制和传播，也禁止出于竞争目的而使用或者透露给他人。

### 1.3 保留更改权力

生产商保留对产品以及单个部件进行技术变更的权利。说明书中使用的图片可能与实际设备存在偏差，仅用于举例介绍产品。

### 1.4 质量保证

质保和质保时间适用现行的“通用商务条款 (AGB)”。条款请见：[www.wilo.com/legal](http://www.wilo.com/legal)  
如果与该条款有所不同，必须在合同中规定，并在执行中优先对待。

#### 质保索赔

如果符合以下几点要求，生产商有义务解决质量和设计方面的所有问题：

- 在质保期内以书面形式向生产商报告产品缺陷。
- 按规定使用产品。
- 已连接所有监控设备，且在试运行前进行过检查。

#### 免责声明

免责声明即免除因人身伤害或物资损失所导致的任何法律责任。只要出现下面所列事项其中之一，就适用这一免责规定：

- 由于运营者或委托方提供的数据存在缺陷或者错误，导致出现配置欠缺问题
- 不遵守安装及操作说明
- 未按规定使用
- 违规存放或运输
- 错误安装或拆卸
- 保养不良
- 未经允许进行维修
- 现场施工不当
- 化学、电气或电化学影响
- 磨损

## 2 安全

本章节主要介绍各生命阶段适用的基础提示信息。不遵守提示会导致下列危险：

- 电气、机械和细菌作用以及电磁场危害人身安全
- 有害物质泄漏会污染环境
- 物资损失
- 产品重要功能失灵

不遵守提示信息会导致丧失索赔权利。

此外也应遵守其他章节列出的各项指导说明和安全说明！

### 2.1 安全说明的标识

本安装及操作说明针对物资损失和人身安全问题列举了多项安全说明。其表现形式各有不同：

- 涉及到人身安全问题的安全说明以一个信号词作为开端，配套使用相应的符号并使用灰色作为背景色。



#### 危险

##### 危险类型和危险源！

危险产生的影响以及避免危险说明。

- 涉及到物资损失问题的安全说明也以一个信号词作为开端，但是没有符号。

---

#### 小心

##### 危险类型和危险源！

影响或信息。

---

## 信号词

- 危险！  
如不注意，会导致死亡或重伤！
- 警告！  
如不注意，可能导致人员受伤（重伤）！
- 小心！  
如不遵守，可能造成物资损失，甚至导致全损。
- 提示！  
操作产品时有用的注意事项

## 文本说明

- ✓ 前提条件
  1. 操作步骤/细目列举
    - ⇒ 提示/指导
  - ▶ 结果

## 图标

本说明书使用下图标：



电击危险



细菌感染危险



爆炸危险



爆炸气体导致危险



一般警告图标



切割受伤警告



高温表面警告



高压警告



悬挂物警告



个人防护装备：戴安全头盔



个人防护装备：穿劳保鞋



个人防护装备：戴防护手套



个人防护装备：戴口罩



个人防护装备：戴护目镜



禁止独自工作！必须两人在场。



实用注意事项

## 2.2 工作人员资格鉴定

工作人员必须：

- 了解当地现行的事故预防条例。
- 已阅读安装及操作说明书并且理解其中内容。

工作人员必须具备下列资质：

- 电气作业：电气作业必须由专业电工执行。
- 安装/拆卸工作：必须由专业人员执行，而且要求该人员接受过相关培训，了解工作中会用到的工具以及当前施工现场需要使用的固定材料。
- 保养工作：必须由熟悉所使用工作介质及其废弃处置的专业人员执行。此外工作人员还必须具有机械制造方面的基础知识。

“专业电工”定义

所谓“专业电工”，是指接受过相关培训，具备所需知识和经验，能够发现并且规避电力危险的人员。

## 2.3 电气作业

- 电气作业由专业电工负责执行。
- 在对产品开始任何作业之前，都应先将其断电并采取措施防止重新接通。
- 通电时注意遵守当地相关法规。
- 注意遵守当地供电公司的相关规定。
- 将电气连接方式等知识告知相关人员。
- 告知相关人员如何关闭产品。
- 遵守本安装及操作说明以及铭牌上给出的技术参数。
- 将产品接地。
- 遵守电气开关设备连接规定。
- 如果使用启动控制器（比如软启动或变频器等），注意遵守电磁兼容性规定。如果需要，考虑采取专业措施（比如使用屏蔽电缆和滤波器等）。
- 更换损坏的接线电缆。请咨询客户服务部。

## 2.4 监控装置

安装方必须准备下列监控设备：

### 断路器

断路器的规格和开关属性取决于所连接产品的额定电流。注意遵守当地相关法规。

### 电机保护开关

对于不带插头的产品，安装方应该准备一个电机保护开关！最低要求是配备一个符合本地规定，具备温度补偿、差分触发和重启锁定功能的热敏继电器/电机保护开关。针对反应灵敏的电网，安装方还应准备其他保护装置（比如超压、欠压或缺相继电器等）。

### 漏电断路器 (RCD)

遵守当地供电公司的相关规定！建议使用漏电断路器。

如果人员可能接触到产品和导电液体，需要对电路连接采取安全措施，装备一个漏电断路器 (RCD)。

## 2.5 在危害健康的介质内使用

如果在危害健康的介质内使用产品，可能导致细菌感染危险！拆下之后，以及再次使用之前，应该彻底清洁产品并进行消毒。运营者必须注意以下几点：

- 进行产品清洁时，提供下列防护装备供工作人员使用：
  - 封闭式护目镜
  - 氧气面罩
  - 防护手套
- 告知所有工作人员，流体会导致危险，并普及正确的流体处理方法！

## 2.6 运输

- 必须穿戴以下防护装备：



- 安全鞋
  - 安全头盔 (使用提升设备的情况下)
  - 运输产品时始终抓住把手。切勿拖拽电源线！
  - 只使用合法且获得认证的提升装置。
  - 根据实际情况 (天气、接合点、负载等) 选择提升装置。
  - 始终把提升装置固定在接合点 (把手或吊孔) 上。
  - 使用期间必须保证提升设备稳定可靠。
  - 使用提升设备时, 如果需要 (比如视线受阻), 必须安排另外一位工作人员负责协调。
  - 切勿在悬挂物下停留。悬挂物切勿从有人员停留的工作位置上方经过。
- 2.7 安装/拆卸工作**
- 穿戴以下防护装备：
    - 安全鞋
    - 安全手套, 用以预防切割伤害
    - 安全头盔 (使用提升设备的情况下)
  - 遵从当地有关作业安全和事故防范措施的现行法律法规。
  - 将产品断电并采取安全措施防止意外接通。
  - 所有旋转零部件均须保持静止。
  - 在封闭的空间内需提供足够的通风条件。
  - 在集水坑和封闭空间内作业时, 为安全起见, 必须有第二个人在场。
  - 如果出现有毒气体或窒息气体汇集的情况, 立刻采取对策！
  - 彻底清洁产品。如果在危害健康的流体内使用过产品, 请消毒！
  - 进行所有焊接作业或使用电气装置工作时, 确保不存在爆炸风险。
- 2.8 运行期间**
- 穿戴以下防护装备：
    - 安全鞋
    - 耳罩 (遵循工作规程的相关通知)
  - 产品工作区域不是人员停留区。在产品运行过程中, 禁止任何人在工作区域内停留。
  - 一旦发生故障或者出现异常, 操作人员必须立即报告主管。
  - 一旦出现危及人身安全的缺陷, 操作人员必须立刻关闭设备：
    - 安全和监控设备故障
    - 外壳部件损坏
    - 电气装置损坏
  - 切勿探入进水口中。旋转的部件可能会对身体造成挤压或割伤。
  - 如果电机在运行过程中浮出水面, 电机外壳温度可能超过 40 °C (104 °F)。
  - 打开入口侧和出口侧管路中的所有截止阀。
  - 通过干转保护确保不会低于最低水浸。
  - 在一般工作条件下, 产品的噪声低于 85 dB(A)。但是实际发出的噪声受多种因素影响：
    - 安装深度
    - 安装
    - 固定附件和管路
    - 工况点
    - 潜水深度
  - 如果产品在有效的工作条件下运行, 则运营者必须执行声压测量。噪声超过 85 dB(A) 时, 必须戴耳罩, 并在工作规程中进行说明！
- 2.9 维护工作**
- 穿戴以下防护装备：
    - 封闭式护目镜
    - 安全鞋
    - 安全手套, 用以预防切割伤害
  - 始终在运行空间/安装地点以外执行维护工作。
  - 只执行本安装及操作说明中列出的维护工作。
  - 进行维护和维修时, 只能使用生产商提供的原装部件。由于使用非原装部件而造成的任何损失, 生产商概不承担任何责任。
  - 一旦发生流体和工作介质泄露事故, 立即收集泄漏物并按照当地现行法规进行废弃处理。
  - 将工具保管在指定位置。
  - 工作结束后, 重新安装所有安全和监控设备, 并检查其功能是否正确。
- 更换工作介质**
- 一旦发生损坏, 电机内可能形成高达数巴的压力！打开螺旋塞时, 这种压力会向外冲出。如果打开螺旋塞时不注意, 它可能会高速弹出！请始终遵守以下指示, 避免受伤：
- 遵守规定的工作步骤顺序。
  - 缓慢转动螺旋塞, 不要完全拧出。开始泄压之后 (可听见空气鸣叫声或嘶嘶声), 不要继续转动螺旋塞。

**警告！泄压时可能喷出高温工作介质，会导致烫伤！为了避免受伤，执行任何作业之前，都应先将电机冷却到环境温度！**

- 待泄压完成之后，完全拧出螺旋塞。

## 2.10 工作介质

电机密封室内注有白油。定期维护时必须更换工作介质，之后按照本地相关法规进行废弃处置。

## 2.11 运营者的责任

- 为工作人员提供以其母语写成的安装及操作说明。
- 为工作人员提供必要的培训，确保其能胜任指派的工作。
- 提供必要的防护装备并保证工作人员佩戴防护装备。
- 使产品上安装的安全和提示标牌长期保持清晰可读状态。
- 使工作人员了解设备的功能原理。
- 杜绝电流导致危险。
- 为设备中的危险部件装备触摸防护装置（安装方提供）。
- 标记工作区并采取安全措施。
- 为工作人员指定工作范围，保证安全作业。

禁止儿童和 16 岁以下或身体、感官或精神上能力不足的人员处理该产品！18 岁以下人员必须由专业人员监督！

## 3 应用/使用

### 3.1 规定用途

潜水泵适用于泵送：

- 含有粪便的污水
- 污水（含少量沙子和砂砾）
- 工艺污水
- 干物质所占比例不超过 8 % 的流体

### 3.2 未按规定使用



#### 危险

**输送爆炸性流体会导致爆炸！**

严禁输送纯粹形态下的易燃易爆流体（汽油、煤油等）。爆炸导致生命危险！水泵不是针对这类流体设计出的产品。



#### 危险

**危害健康的流体会导致危险！**

如果在危害健康的流体中使用过水泵，则拆卸水泵后必须进行消毒处理，之后才能用于其他工作！有生命危险！遵守工作规程的相关规定！运营者必须保证工作人员已经收到并阅读工作规程！

潜水泵不得用于泵送以下流体：

- 饮用水
- 混杂硬物（比如石头、木头、金属等）的流体
- 含有大量磨蚀性物质（比如沙子、砂砾等）的流体。

符合规定的使用还包括遵守本说明的规定。任何超出规定范围的应用均视为不合规规定。

## 4 产品说明

### 4.1 结构

污水潜水泵作为潜水式整机组，适用于在湿式安装和干式地坑安装下连续运行。

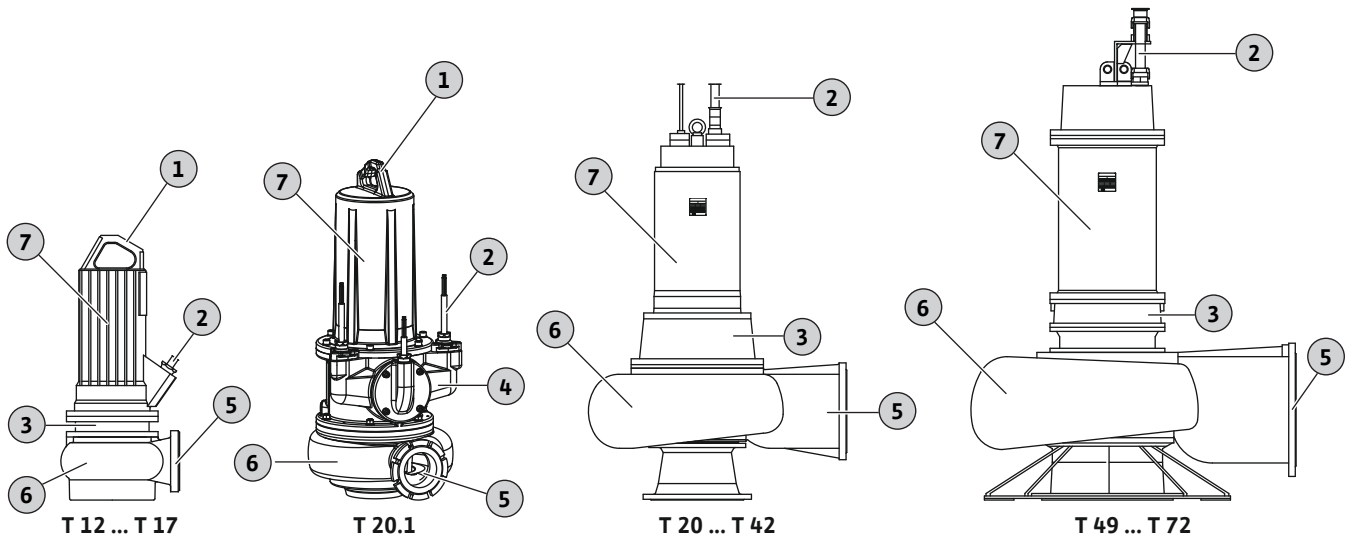


Fig. 1: 概述

1	把手
2	接线电缆
3	密封壳体
4	轴承外壳
5	出水口
6	水力部件外壳
7	电机

#### 4.1.1 水力部件

离心式水力部件配备不同形式的叶轮、出口侧水平法兰接口、检查盖以及泵体密封环和叶轮耐磨环。

水力部件不是自吸式产品，即流体必须自动流入或者在一定的供给压力下流入。

##### 叶轮形式

叶轮形式取决于叶轮规格，不是所有叶轮形状都适合所有水力部件。下文概要介绍各种叶轮形式：

- 涡流叶轮
- 单通道叶轮
- 双通道叶轮
- 三通道叶轮
- 四通道叶轮
- SOLID 叶轮，封闭或半开

##### 检查盖（取决于水力部件）

水力部件外壳上的辅助孔。通过这个辅助孔，可以清除水力部件中的堵塞物。

##### 泵体密封环和叶轮耐磨环（取决于水力部件）

进水口和叶轮在泵送过程中大多承受负荷。如果装备通道叶轮，则叶轮和进水口之间的间隙是保持恒定效率的重要因素。叶轮和进水口之间的间隙越大，输送功率的损耗就越高。效率降低，发生堵塞的几率提高。为了确保水力部件能够长期高效运行，视装备的叶轮和水力部件而定，设备装有一个叶轮耐磨环和/或泵体密封环。

- 叶轮耐磨环  
叶轮耐磨环安装在通道叶轮上，保护叶轮的入流边。
- 泵体密封环  
泵体密封环安装在水力部件的进水口中，保护通向离心室的入流边。

一旦发生磨损，可以根据具体需要，轻松更换这两个部件。

#### 4.1.2 电机

使用三相交流电规格的表面冷却型电机作为驱动。通过周围的流体进行冷却。余热通过电机外壳直接排放到流体或周围空气中。电机可以在运行过程中露出液面。视电机功率而定，支持在干式地坑安装模式下运行。

视电机的结构规格而定，电机装备情况不尽相同：

- 滚动轴承：永久润滑，免维护或者定期涂抹油脂

- 电机中的冷凝水（凝露）：可排出

#### 电机装备概述

	T 12 ... T 20	T 20.1	T 24 ... T 42	T 49、T 56	T 50、T 50.1、 T 57.1、T 63.1	T 63.2、T 72
冷凝水（凝露）泄漏腔*	-	-	•	•	•	•
滚动轴承：永久润滑	•	•	•	•	-	-
滚动轴承：定期涂抹油脂	-	-	-	-	•	•

• = 标配，- = 不可用

\* 注意！如果电机获得防爆认证，则不是所有电机都能把冷凝水排出。视具体电机而定，防火花区域设有排水螺栓！

接线电缆可纵向防水，且电缆末端露出。

#### 4.1.3 密封件

流体密封件和电机舱密封件类型不同：

- “H”型：电机侧骨架油封，流体侧机械密封
- “G”型：两个单独的机械密封
- “K”型：两个机械密封装在一个不锈钢制成的整装密封盒中

如果密封件发生泄漏，液体会进入密封室或泄漏腔：

- 密封室接收流体侧密封件泄漏出的液体。
  - 泄漏腔接收电机侧密封件泄漏出的液体。
- 如果电机未附加装备泄漏腔，电机侧密封件泄露出的液体会进入电机。

#### 密封室和泄漏腔概述

	T 12 ... T 20	T 20.1	T 24 ... T 42	T 49、T 56	T 50、T 50.1、 T 57.1、T 63.1	T 63.2、T 72
密封室	•	•	•	•	•	•
泄漏腔	-	•	-	-	•	•

• = 标配，- = 不可用

机械密封之间的密封室填充有白油。泄漏腔则是空的。

#### 4.1.4 材料

标准规格使用下列材料：

- 水泵壳体：EN-GJL-250 (ASTM A48 Class 35/40B)
- 叶轮：EN-GJL-250 (ASTM A48 Class 35/40B)
- 电机外壳：EN-GJL-250 (ASTM A48 Class 35/40B)
- 电机侧密封件：
  - “H”= NBR（丁腈橡胶）
  - “G”= 石墨/陶瓷或 SiC/SiC
  - “K”= SiC/SiC
- 流体侧密封件：SiC/SiC
- 静态密封件：NBR（丁腈橡胶）

材料的精确参数体现在相应的配置中。

## 4.2 监控设备

### 监控设备概述

	T 12 ... T 17	T 20	T 20.1	T 24 ... T 42	T 49, T 56	T 50, T 50.1, T 57.1, T 63.1	T 63.2, T 72
<b>内部监控设备</b>							
电机舱	•	•	-	-	-	-	-
端子室/电机舱	-	-	•	•	•	•	•
电机绕组	•	•	•	•	•	•	•
电机轴承	-	o	o	o	o	o	o
密封室	•	-	-	-	-	•	•
泄漏腔	-	-	•	-	-	•	•
振动传感器	-	-	-	o	o	o	o
<b>外部监控设备</b>							
密封室	o	o	o	o	o	o	o

• = 标配, - = 不可用, o = 可选

所有现有的监控设备必须始终处于连接状态！

#### 电机舱监控装置

电机舱监控装置可以保护电机绕组免于短路。湿度探测通过一个电极实现。

#### 端子室和电机舱监控

端子室和电机舱监控设备保护电机接口和电机绕组免于短路。湿度探测通过端子室和电机舱内的电极实现。

#### 电机绕组监控装置

电机过热保护装置可以保护电机绕组免于过热。标配安装一个带双金属片的温度限制装置。

温度探测装置可以选装一个 PTC 传感器。此外也可将电机过热保护装置用作温度调节装置。这样就可以探测两个温度。达到低温之后, 可以在电机冷却后执行一次自动重启。只有达到高温时, 才必须使用重启锁定功能执行一次关机。

#### 密封室内部监控

密封室内装有一个内部铅芯湿度电极。电极记录通过液体侧机械密封渗入流体的事件。之后就可以通过水泵控制器生成报警或者关闭水泵。

#### 密封室外部监控装置

密封室可以装备一个外部铅芯湿度电极。电极记录通过液体侧机械密封渗入介质的事件。之后就可以通过水泵控制器生成报警或者关闭水泵。

#### 泄漏腔监控

泄漏腔装有一个浮子开关。浮子开关记录通过电机侧机械密封渗入流体的事件。之后就可以通过水泵控制器生成报警或者关闭水泵。

#### 电机轴承监控

电机轴承热监控设备保护滚动轴承免于过热。使用 Pt100 传感器记录温度。

#### 监控运行条件决定的振动

水泵可以装备一个振动传感器。振动传感器记录运行过程中出现的振动事件。视具体极值而定, 必须通过水泵控制器发出报警消息或者关闭水泵。

注意！极值须于现场在试运行阶段规定并记录在试运行记录当中！

## 4.3 运行模式

### 运行模式 S1：连续运行

水泵能在额定负荷下连续运行, 而不会超过允许的温度。

## 运行模式：非浸入运行

“非浸入运行”这种运行模式描述电机在水泵运行过程中浮出水面。这时水位可以降低至更低位置，直至达到水力部件上缘。

	T 12 ...T 17	T 20	T 20.1	T 24 ...T 42	T 49、T 56	T 50、T 50.1 T 57.1、T 63.1	T 63.2、T 72
允许非浸入运行	是	否	是	是	否	是	否

非浸入运行时注意以下几点：

- 已指定“非浸入”运行模式  
允许在“非浸入”运行模式下露出电机。
- 未指定“非浸入”运行模式  
如果配备装有温度调节装置（双回路温度监控装置）的电机，则允许露出电机。电机冷却后，可以通过低温功能自动重启。只有达到高温时，才必须使用重启锁定功能执行一次关机。小心！为了保护电机绕组免于过热，必须为电机装备温度调节装置！如果只装有温度限制装置，则电机不可在运行过程中浮出水面。
- 最高流体和环境温度：最高环境温度相当于铭牌上标注的最高流体温度。  
小心！适用电机 T 12：非浸入运行过程中，允许的最高流体和环境温度为 30 °C！

## 4.4 使用变频器运行

允许使用变频器运行设备。相关要求参见附录并注意遵守！

## 4.5 在易爆环境中运行

## 标准电机概述

	T 12	T 13	T 17	T 17.2	T 20	T 20.1	T 24	T 30	T 34	T 42	T 49	T 50	T 50.1	T 56	T 63.1/T 63.2	T 72
ATEX 认证	o	o	o	o	o	o	o	o	o	o	-	-	o	o	o	-
FM 认证	o	o	o	o	o	o	o	o	o	o	o	-	o	o	o	-
CSA-Ex 认证	o	o	o	o	o	-	o	o	o	-	-	-	-	-	-	-

## 图片说明

-- 不存在/不可能，o = 可选，• = 标配

## IE3 电机（根据 IEC 60034）概述

	T 17 ...-E3	T 17.2 ...-E3	T 20.1 ...-E3	T 24 ...-E3	T 30 ...-E3	T 34 ...-E3	T 42 ...-E3	T 50.1 ...-E3	T 57.1 ...-E3	T 63.1 ...-E3	T 63.2 ...-E3
ATEX 认证	o	o	o	o	o	o	o	o	o	o	o
FM 认证	-	-	-	-	-	-	-	-	-	-	-
CSA-Ex 认证	-	-	-	-	-	-	-	-	-	-	-

## 图片说明

-- 不存在/不可能，o = 可选，• = 标配

在爆炸性气体中使用时，水泵铭牌上必须具有下列标识：

- 相应认证的防爆标识
- 防爆等级

关于防爆电缆的相关要求，参见本操作说明书的附录，并注意遵守要求！

**ATEX 认证**

水泵适合在潜在爆炸环境中运行：

- 设备组：II
  - 类别：2, 1 区和 2 区
- 水泵不可在 0 区使用！

**FM 认证**

水泵适合在潜在爆炸环境中运行：

- 防护等级：Explosionproof
  - 类别：Class I, Division 1
- 注意：如果根据 Division 1 布线，则也允许在 Class I, Division 2 中安装。

**按区 (Division) 分级的 CSA 防爆认证 (电机 T 12、T 13、T 17、T 17.2、T 20、T 34)**

水泵适合在潜在爆炸环境中运行：

- 防护等级：Explosion-proof
- 类别：Class 1, Division 1

**按区段 (Zone) 分级的 CSA 防爆认证 (电机 T 24、T 30)**

水泵适合在潜在爆炸环境中运行：

- 设备组：II
  - 类别：2, 1 区和 2 区
- 水泵不可在 0 区使用！

**4.6 铭牌**

下面概要介绍铭牌上的缩写词和相关数据：

铭牌缩写词	含义
P-Typ	水泵类型
M-Typ	电机类型
S/N	序列号
Art.-No.	商品号
MFY	生产日期*
$Q_N$	工况点流量
$Q_{max}$	最大流量
$H_N$	工况点扬程
$H_{max}$	最大扬程
$H_{min}$	最小扬程
n	转速
T	流体最高温度
IP	防护等级
I	额定电流
$I_{ST}$	启动电流
$I_{SF}$	服务因数下的额定电流
$P_1$	功耗
$P_2$	额定功率
U	额定电压
f	频率
$\cos \varphi$	电机效率
SF	服务因数
$OT_S$	运行模式：潜水式
$OT_E$	运行模式：非潜水式
AT	起动方式
$IM_{org}$	叶轮直径：初始
$IM_{korr}$	叶轮直径：修正后

\*生产日期书写格式符合 ISO 8601 标准：JJJJWww

- JJJJ = 年份
- W = 周缩写词
- ww = 日历周数据

#### 4.7 型号代码

示例：

Wilo-EMU FA 15.52-245E + T 17.2-4/24HEX-E3  
 Wilo-Rexa SUPRA-V10-736A + T 17.2-4/24HEX-E3  
 Wilo-Rexa SOLID-Q10-345A + T 17.2-4/24HEX-E3

##### 水力部件型号代码“EMU FA”

FA	污水泵
15	x10 = 压力连接公称直径
52	内部功率因数
245	叶轮初始直径 (仅限标准型号, 经过配置的水泵不适用)
D	叶轮形式： W = 涡流叶轮 E = 单通道叶轮 Z = 双通道叶轮 D = 三通道叶轮 V = 四通道叶轮 T = 闭式双通道叶轮 G = 半开式单通道叶轮

##### 水力部件型号代码“Rexa SUPRA”

SUPRA	污水泵
V	叶轮形式： V = 涡流叶轮 C = 单通道叶轮 M = 多通道叶轮
10	x10 = 压力连接公称直径
73	内部功率因数
6	特征曲线编号
A	材料规格： A = 标准规格 B = 防腐 1 D = 防磨 1 X = 特殊规格

##### 水力部件型号代码“Rexa SOLID”

SOLID	污水泵配备 SOLID 叶轮
Q	叶轮形式： T = 闭式叶轮 G = 半开式单通道叶轮 Q = 半开式双通道叶轮
10	x10 = 压力连接公称直径
34	内部功率因数
5	特征曲线编号
A	材料规格： A = 标准规格 B = 防腐 1 D = 防磨 1 X = 特殊规格

##### 电机型号代码

T	表面冷却电机
17	规格
2	结构形式
4	极数



示例： Wilo-EMU FA 15.52-245E + T 17.2-4/24HEX-E3 Wilo-Rexa SUPRA-V10-736A + T 17.2-4/24HEX-E3 Wilo-Rexa SOLID-Q10-345A + T 17.2-4/24HEX-E3	
24	包装箱长度，单位 cm
H	密封形式
Ex	具有防爆认证
E3	IE 能效等级（根据 IEC 60034-30 标准）

4.8 供货范围

标准泵

- 水泵带裸露电缆端部
- 安装及操作说明

经过配置的水泵

- 水泵带裸露电缆端部
- 根据客户需求提供相应长度的电缆
- 所安装的附件，例如外部铅芯湿度电极、水泵支脚等
- 安装及操作说明

4.9 附件

- 悬挂装置
- 水泵支脚
- 有 Ceram 涂层或使用特殊材料的特殊版本
- 外部铅芯湿度电极，用于密封室监控
- 液位控制装置
- 固定附件和链条
- 控制开关、继电器和插头

5 运输和存放

5.1 交货

收到货物之后，必须立刻检查货物有无缺陷（损坏、完整性）。如有缺陷，必须标注在运单上！此外还必须在到货当天，将损坏情况告知运输公司或者生产商。如果不在当天通知，就会丧失索赔权利。

5.2 运输



警告

在悬挂物下停留！

所有人严禁在悬挂物下停留！零部件掉落会导致（严重）受伤。悬挂物切勿从有人员停留的工作位置上方经过！



警告

不佩戴防护装备会导致头部和脚部受伤！

工作时存在（严重）受伤危险。穿戴以下防护装备：

- 安全鞋
- 如果使用提升设备，还必须佩戴安全头盔！



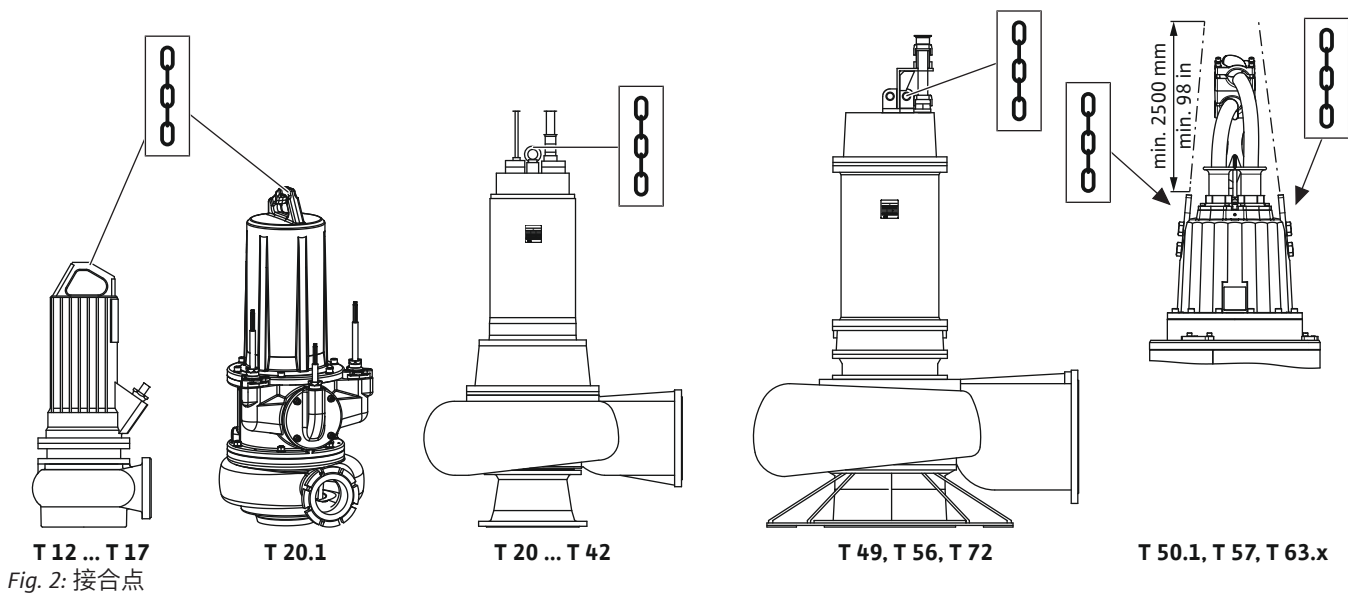
注意

请只使用技术方面毫无瑕疵的提升设备！

请只使用技术方面毫无瑕疵的提升设备提升和降低水泵。确保水泵在升降过程中不会卡住。切勿超过提升设备允许的最大承载能力！开始使用之前，先检查提升设备的功能是否正常！

为了避免水泵在运输途中受损，到达使用地之后再拆除包装。发运使用过的水泵时，必须使用尺寸足够大而且不易撕破的塑料袋进行包装，包装时注意收口。

此外还请注意以下几点：



- 遵守所在国现行的安全法规。
- 使用合法且获得认证的升降装置和提升装置。
- 根据实际情况（天气、吊挂点、负载等）选择提升装置。
- 只将提升装置固定在吊挂点上。必须使用卸扣进行固定。
- 使用具备足够承载能力的提升设备。
- 使用期间必须保证提升设备稳定可靠。
- 使用提升设备时，如果需要（比如视线受阻），必须安排另外一位工作人员负责协调。

### 5.3 存放



#### 危险

##### 危害健康的流体会导致危险！

如果在危害健康的流体中使用过水泵，则拆卸水泵后必须进行消毒处理，之后才能用于其他工作！有生命危险！遵守工作规程的相关规定！运营者必须保证工作人员已经收到并阅读工作规程！



#### 警告

##### 叶轮和进水口的锋利边缘！

叶轮和进水口可能形成锋利的边缘。导致四肢被割伤的危险！必须佩戴防护手套，防止出现切割受伤的情况。

#### 小心

##### 渗入湿气导致全损

湿气渗入电源线会损坏电源线和水泵！切勿将电源线端部浸入液体中，存放时必须将其牢牢封住。

新水泵到货后，可以存放一年。如果存放时间超过一年，请咨询客户服务部。

存放时注意下列事项：

- 将水泵直立（垂直）放置在坚固的基底上并固定好，防止其翻倒或滑倒！
- 存储温度范围是  $-15$  至  $+60$  °C ( $5$  至  $140$  °F)，空气湿度最高 90%，非冷凝。建议使用温度介于  $5$  至  $25$  °C ( $41$  至  $77$  °F)，相对空气湿度在 40% 至 50% 之间的防冻仓库。
- 切勿在执行焊接作业的室内存放水泵。因为焊接时形成的气体或辐射可能侵蚀弹性体零件和涂层。
- 牢牢封闭住吸入接口和压力接口。
- 保护电源线，防止其弯折和损坏。
- 保护水泵免受阳光直射和热侵蚀。外部热量可能导致叶轮和涂层受损！
- 每隔一段时间（隔 3-6 个月），将叶轮转动 180°。从而防止轴承无法转动，并更换机械密封的润滑膜。警告！叶轮和进水口的锋利边缘可能导致人员受伤！

- 弹性体零件和涂层会自然脆化。如果存放时间超过 6 个月，必须咨询客户服务部。结束存放时段之后，必须清洁水泵上的灰尘和油，并检查涂层和损坏情况。如果涂层受损，须在继续使用前将其修复。

**6 安装及电气连接**  
**6.1 工作人员资格鉴定**

- 电气作业：电气作业必须由专业电工执行。
- 安装/拆卸工作：必须由专业人员执行，而且要求该人员接受过相关培训，了解工作中会用到的工具以及当前施工现场需要使用的固定材料。

**6.2 安装方式**

- 垂直固定湿式安装
- 垂直移动湿式安装
- 垂直固定干式地坑安装

安装方式取决于电机类型：

电机类型	固定湿式	移动湿式	固定干式
T 12 ...T 17	•	•	•
T 20.1	•	•	•
T 20 ...T 24	•	o	o
T 30 ...T 34	•	-	o
T 42 ...T 72	•	-	-

图片说明：- = 不可能，o = 可根据订单调整，• = 可能

不支持下列安装方式：

- 卧式安装

**6.3 运营者的责任**

- 遵守本地现行的同业工伤事故保险联合会的事事故防范规定和安全规定。
- 遵守有关处理重物或在悬挂物之下工作的所有法律法规。
- 提供防护装备并保证工作人员佩戴防护装备。
- 运行污水处理技术设备时，注意遵守当地实施的废水处理技术法规。
- 避免压力冲击！  
高压管道较长且有明显的起伏时，可能出现压力冲击。该压力冲击可能导致水泵损坏！
- 根据运行条件和集水坑规格，保证电机冷却时间。
- 建筑/地基必须具有足够的强度，这样才能安全可靠地固定并确保功能正常。准备建筑/地基并保证其适用性，是运营者的责任！
- 检查现有的规划资料（安装图、运行空间结构图、入流情况）是否齐全和正确。

**6.4 安装**



**危险**

**独自执行危险作业导致生命危险！**

需要在竖井和狭窄空间内完成的工作，以及存在坠落危险的工作，这两个都是危险工种，不允许单人独自作业！为安全起见，必须有第二个人在场。



**警告**

**不佩戴防护装备会导致手脚受伤！**

工作时存在（严重）受伤危险。穿戴以下防护装备：

- 安全手套，用以预防切割伤害
- 安全鞋
- 如果使用提升设备，还必须佩戴安全头盔！



**注意**

请只使用技术方面毫无瑕疵的提升设备！

请只使用技术方面毫无瑕疵的提升设备提升和降低水泵。确保水泵在升降过程中不会卡住。切勿超过提升设备允许的最大承载能力！开始使用之前，先检查提升设备的功能是否正常！

- 如下准备运行空间/安装地点：
  - 干净，无大颗粒固体
  - 干燥
  - 不上冻
  - 经过消毒处理
- 如果出现有毒气体或窒息气体汇集的情况，立刻采取对策！
- 将吊具通过一个卸扣固定在接合点上。只使用建筑技术允许使用的提升装置。
- 提升、降低和运输水泵时，使用吊具。切勿拖拽电源线移动水泵！
- 必须能安全地安装提升设备。必须能通过提升设备到达储存位置和运行空间/安装地点。安装位置的地基必须坚实。
- 铺设的电源线必须能够安全运行。检查电缆横截面和电缆长度对于选择的铺设方式来说是否足够。
- 使用控制开关时，必须注意相应的防护等级。请将控制开关安装在潜在爆炸环境以外且注意使其具有溢流安全特性！
- 在入口使用导流板或偏转板，避免流体内进入空气。如有空气进入，会汇集在管道系统中，导致形成不允许出现的运行条件。通过排气装置排出流体中的空气！
- 禁止水泵空运行！避免水力部件外壳或管道系统内进入空气。切勿低于最低水位。建议安装干转保护装置！

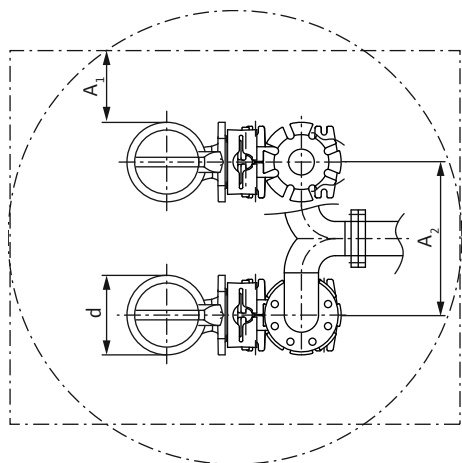
**6.4.1 双头泵运行注意事项**

Fig. 3: 最小距离

如果在一个运行空间内使用多台水泵，则必须遵守水泵与水泵之间，以及水泵与墙壁之间的最小距离。不同类型的设备，距离有所不同：交替运行或并联运行。

d	水力部件外壳直径
A <sub>1</sub>	最小距离： - 交替运行：最小 0.3×d - 并联运行：最小 1×d
A <sub>2</sub>	高压管道距离 - 交替运行：最小 1.5×d - 并联运行：最小 2×d

**6.4.2 水平供货的水泵卸货**

为了避免水泵受到较大的牵引力和弯曲力，可以根据规格和重量，以水平状态供应水泵。供货时将水泵放置在专用的运输架上。水泵到货后，注意按照下列工作步骤操作。

**注意**

请只使用技术方面毫无瑕疵的提升设备！

请只使用技术方面毫无瑕疵的提升设备提升和降低水泵。确保水泵在升降过程中不会卡住。切勿超过提升设备允许的最大承载能力！开始使用之前，先检查提升设备的功能是否正常！

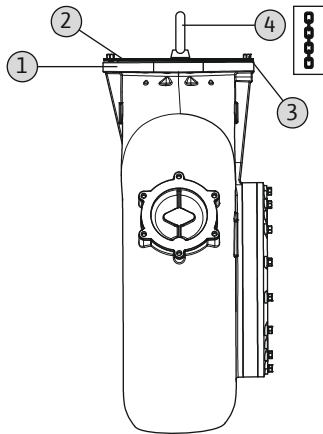


Fig. 4: 安装接合点

将接合点（安装方提供）安装在出水口上

1	压力连接
2	吊架
3	吊架/压力连接固定件
4	用于 90° 以下弯曲负载的接合点

- ✓ 具有相应的承载能力，用于固定接合点的吊架
  - ✓ 用于 90° 以下弯曲负载的接合点（比如“Theipa”等型号）
  - ✓ 吊架固定材料
    1. 将吊架放在压力连接处，在两个相对分布的孔处进行固定。
    2. 将接合点固定在吊架上。
- ▶ 接合点安装完毕，水泵已准备就绪，可以开始吊挂。

准备工作

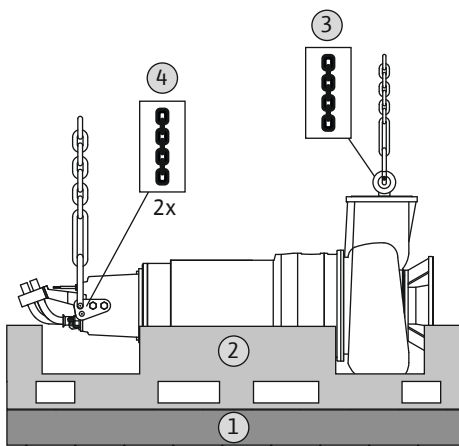


Fig. 5: 水泵卸货：准备工作

1	地基
2	运输架
3	水力部件接合点
4	电机接合点

- ✓ 运输架水平放置在牢固的基底上。
  - ✓ 准备 2 个具有足够承载能力的提升设备。
  - ✓ 准备数量足够的允许使用的提升装置。
    1. 将提升设备固定在水力部件接合点上。
    2. 将提升设备固定在电机接合点上。
- ▶ 为提升和校准水泵做准备。

提升并校准水泵

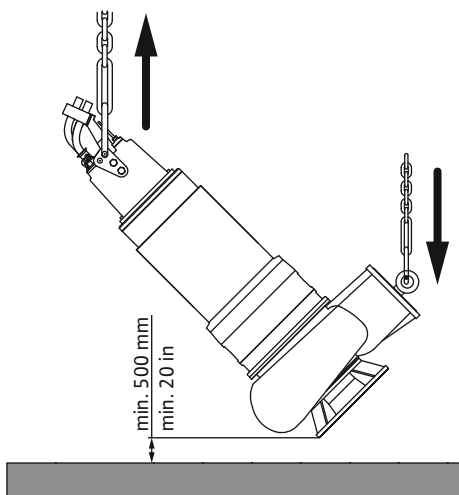


Fig. 6: 水泵卸货：转动

- ✓ 准备完毕
  - ✓ 天气条件允许卸货。
    1. 使用两个提升设备慢慢提起水泵。小心！注意：水泵需要保持水平状态！
    2. 移除运输架。
    3. 通过两个提升设备，沿垂直方向慢慢提起水泵。小心！注意：外壳部分不能触碰到地面。点负荷高会损坏外壳部件。
    4. 水泵完成垂直校准后，在水力部件上松开提升装置。
- ▶ 水泵校准完毕，准备放下。

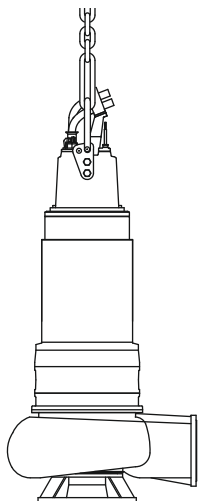


Fig. 7: 水泵卸货：放下

### 6.4.3 维护工作

#### 6.4.3.1 转动叶轮

#### 放下水泵

- ✓ 水泵已完成垂直校准。
- ✓ 将提升装置从水力部件上移除。
  1. 小心地慢慢放下水泵。  
小心！如果水泵放下速度过快，可能会导致水力部件外壳磕碰进水口受损。将水泵慢慢放在进水口上！  
注意！如果水泵不能平放在进水口上，则在下面放置相应的垫板。
- ▶ 水泵准备就绪，可以开始安装。

**警告！** 如果需要临时存放水泵且需拆下提升设备，注意采取保护措施，防止水泵翻倒或滑倒！

如果存放时间超过 6 个月，则在开始安装之前，需要进行以下维护工作：

- 转动叶轮。
- 检查密封室内的油。



#### 警告

#### 叶轮和进水口的锋利边缘！

叶轮和进水口可能形成锋利的边缘。导致四肢被割伤的危险！必须佩戴防护手套，防止出现切割受伤的情况。

#### 小型水泵 (T 12 ... T 20.1)

- ✓ 水泵未连接电网！
- ✓ 防护装备就位！
  1. 将水泵水平放置在坚固的底座上。警告！手可能被挤伤。请确保水泵不会翻倒或滑倒！
  2. 小心谨慎地慢慢把手从下方伸进水力部件外壳中，转动叶轮。

#### 大型水泵 (T 24 ... T 63.2)

- ✓ 水泵未连接电网！
- ✓ 防护装备就位！
  1. 将水泵垂直放置在坚固的底座上。警告！手可能被挤伤。请确保水泵不会翻倒或滑倒！
  2. 小心谨慎地慢慢把手从出水口伸进水力部件外壳中，转动叶轮。

6.4.3.2 检查密封室中的油

电机 T 12、T 13、T 17、T 17.2

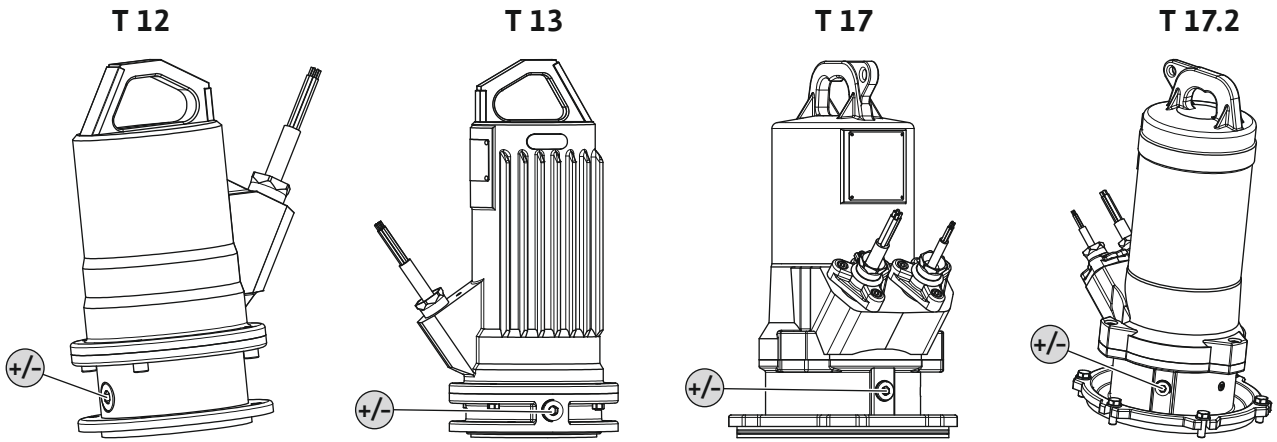


Fig. 8: 密封室：检查油

+/- 为密封室注油/排油

- ✓ 尚未安装水泵。
  - ✓ 水泵尚未连接电网。
  - ✓ 防护装备就位！
1. 将水泵水平放置在坚固的底座上。螺旋塞朝上。警告！手可能被挤伤。请确保水泵不会翻倒或滑倒！
  2. 拧出螺旋塞。
  3. 放置合适的容器用于收集工作介质。
  4. 排放工作介质：转动水泵，直到开口朝下为止。
  5. 检查工作介质：
    - ⇒ 如果工作介质清澈，可以重复利用工作介质。
    - ⇒ 如果工作介质脏污（黑色），则注入新的工作介质。按照当地法规对工作介质进行废弃处置！
    - ⇒ 如果工作介质内有金属屑，请联系客户服务部！
  6. 注入工作介质：转动水泵，直到开口朝上为止。通过开口注入工作介质。
    - ⇒ 遵守规定的工作介质类型和数量！重复利用工作介质时，也必须检查介质量，必要时进行调整！
  7. 清洁螺旋塞，装入新密封环，重新拧入。最大拧紧扭矩：8 Nm (5.9 ft·lb)！

电机 T 20、T 20.1、T 24

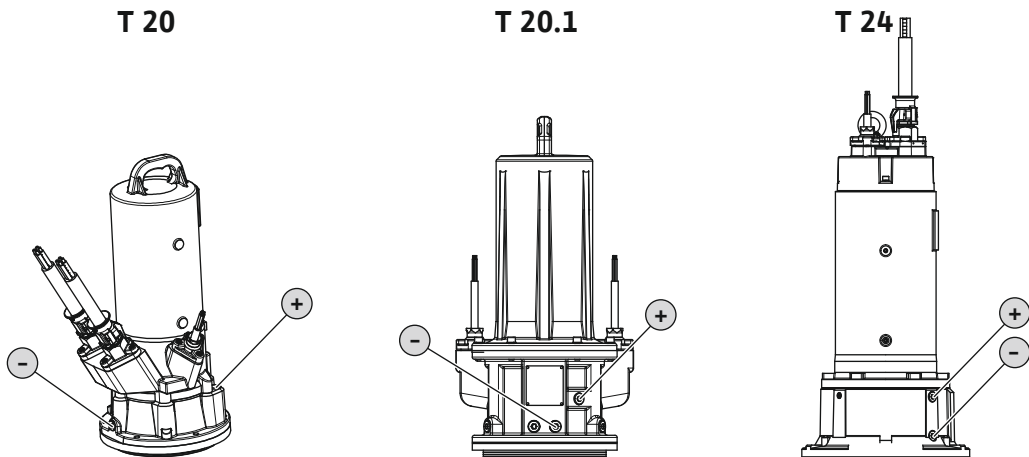


Fig. 9: 密封室：检查油

+ 为密封室注油  
- 为密封室排油

- ✓ 尚未安装水泵。

- ✓ 水泵尚未连接电网。
  - ✓ 防护装备就位！
1. 将水泵垂直放置在坚固的底座上。警告！手可能被挤伤。请确保水泵不会翻倒或滑倒！
  2. 放置合适的容器用于收集工作介质。
  3. 拧出螺旋塞 (+)。
  4. 拧出螺旋塞 (-) 并排出工作介质。如果排放口装有截止球阀，则打开截止球阀。
  5. 检查工作介质：
    - ⇒ 如果工作介质清澈，可以重复利用工作介质。
    - ⇒ 如果工作介质脏污（黑色），则注入新的工作介质。按照当地法规对工作介质进行废弃处置！
    - ⇒ 如果工作介质内有金属屑，请联系客户服务部！
  6. 如果排放口装有截止球阀，则关闭截止球阀。
  7. 清洁螺旋塞 (-)，装入新密封环，重新拧入。最大拧紧扭矩：8 Nm (5.9 ft-lb)！
  8. 通过螺旋塞 (+) 的开孔注入工作介质。
    - ⇒ 遵守规定的工作介质类型和数量！重复利用工作介质时，也必须检查介质量，必要时进行调整！
  9. 清洁螺旋塞 (+)，装入新密封环，重新拧入。最大拧紧扭矩：8 Nm (5.9 ft-lb)！

电机 T 30、T 34、T 42、T 49、T 50.1、T 56、T 57、T 63.x、T 72

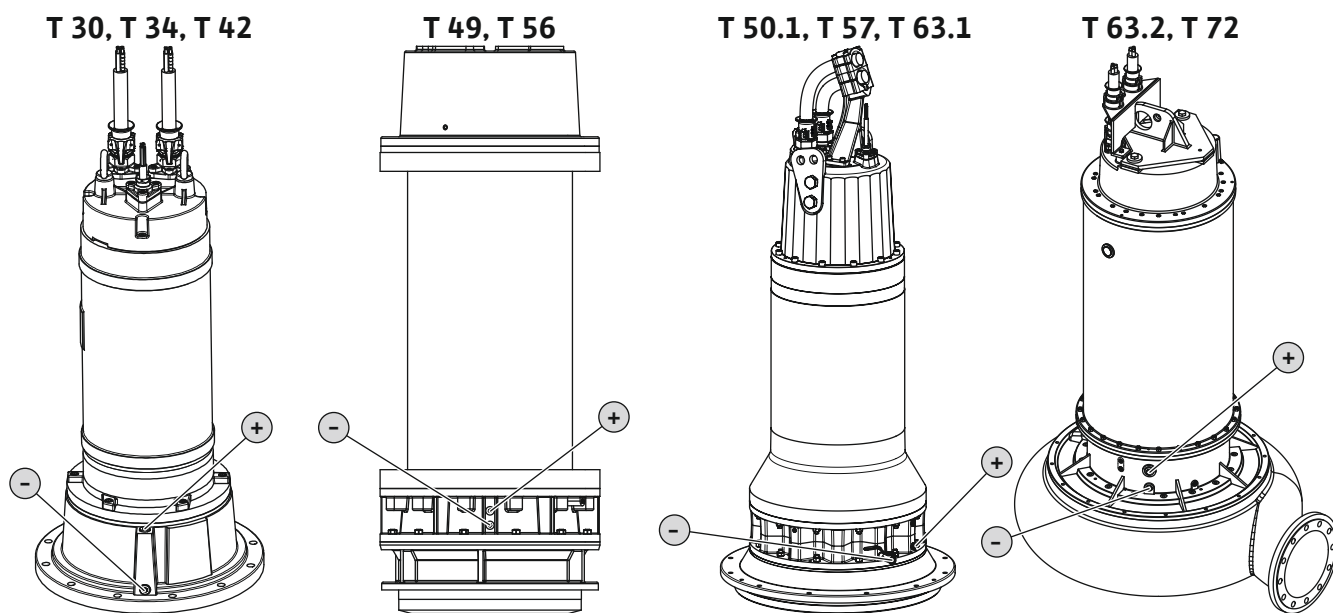


Fig. 10: 密封室：检查油

+	为密封室注油
-	为密封室排油

- ✓ 尚未安装水泵。
  - ✓ 水泵尚未连接电网。
  - ✓ 防护装备就位！
1. 将水泵垂直放置在坚固的底座上。警告！手可能被挤伤。请确保水泵不会翻倒或滑倒！
  2. 放置合适的容器用于收集工作介质。
  3. 拧出螺旋塞 (+)。
  4. 拧出螺旋塞 (-) 并排出工作介质。如果排放口装有截止球阀，则打开截止球阀。
  5. 检查工作介质：
    - ⇒ 如果工作介质清澈，可以重复利用工作介质。



- ⇒ 如果工作介质脏污（黑色），则注入新的工作介质。按照当地法规对工作介质进行废弃处置！
- ⇒ 如果工作介质内有金属屑，请联系客户服务部！
- 6. 如果排放口装有截止球阀，则关闭截止球阀。
- 7. 清洁螺旋塞 (-)，装入新密封环，重新拧入。最大拧紧扭矩：8 Nm (5.9 ft-lb)！
- 8. 通过螺旋塞 (+) 的开孔注入工作介质。
  - ⇒ 遵守规定的工作介质类型和数量！重复利用工作介质时，也必须检查介质量，必要时进行调整！
- 9. 清洁螺旋塞 (+)，装入新密封环，重新拧入。最大拧紧扭矩：8 Nm (5.9 ft-lb)！

6.4.4 固定湿式安装



注意

水位过低导致输送问题

如果流体降至过低的液位，可能导致输送断流。继而在水力部件中形成气垫，导致出现不允许的运行行为。允许的最低水位必须至少达到水力部件外壳的上边缘！

采用湿式安装方式时，将水泵安装在流体中。为此必须在集水坑中安装一个悬挂装置。在悬挂装置上，出口侧连接现场的管道系统，吸入侧连接水泵。连接的管道系统必须能够自行支撑。悬挂装置不得支撑管道系统！

工作步骤

1	截止阀
2	止回阀
3	悬挂装置
4	导流管（现场提供）
5	提升设备接合点
6	最低水位

- ✓ 已备好安装所需的运行空间/安装地点。
- ✓ 悬挂装置和管道系统安装完毕。
- ✓ 水泵已备好，可以在悬挂装置上运行。
- 1. 将提升设备通过一个卸扣固定在水泵接合点上。
- 2. 提升水泵，在集水坑开口摆动，慢慢将导向爪放在导流管上。
- 3. 降下水泵，直到水泵固定在悬挂装置上并自动耦合。小心！在降下水泵的过程中，使电源线保持略微拉紧的状态！
- 4. 将提升装置从提升设备上松开并固定在集水坑出口，防止掉落。
- 5. 安排一名专业电工在集水坑内铺设电源线，并按照规定将电源线从集水坑中引出。
- ▶ 水泵安装完毕，专业电工可以开始进行电气连接。

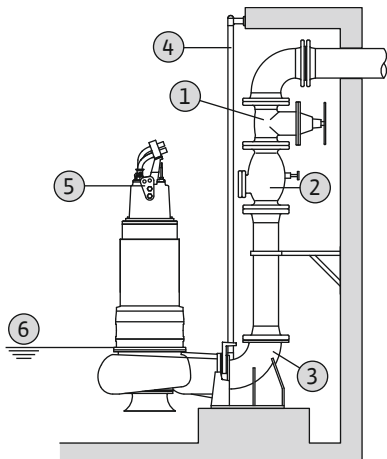


Fig. 11: 固定湿式安装

6.4.5 移动湿式安装



警告

高温表面可能导致烫伤！

电机外壳在运行过程中温度较高，可能导致烫伤。关闭后使水泵冷却到环境温度！



警告

压力软管崩落！

一旦压力软管崩落或崩裂，可能导致人员（重度）受伤。必须把压力软管牢牢固定在出口！防止压力软管弯折。

**注意****水位过低导致输送问题**

如果流体降至过低的液位，可能导致输送断流。继而在水力部件中形成气垫，导致出现不允许的运行行为。允许的最低水位必须至少达到水力部件外壳的上边缘！

采用便携式安装方式时，必须为水泵装备水泵支脚。水泵支脚可以保证水泵在抽吸区域的离地间隙不会低于最小值，同时还能使水泵稳固立在坚实的基底上。这样一来，采用这种安装方式时，就能将水泵随意放在运行空间/安装地点的任意位置。安装地点必须使用硬底座，避免软底座发生下沉事故。出口侧连接压力软管。如果水泵需要长时间运行，则将水泵固定安装在地面。这样可以避免振动，保证水泵安静且低磨损地运行。

**工作步骤**

1	水泵支脚
2	带软管连接或 Storz 管接头的弯管
3	Storz 软管接头
4	压力软管
5	提升设备
6	接合点
S*	非潜水运行模式：注意铭牌上的说明！

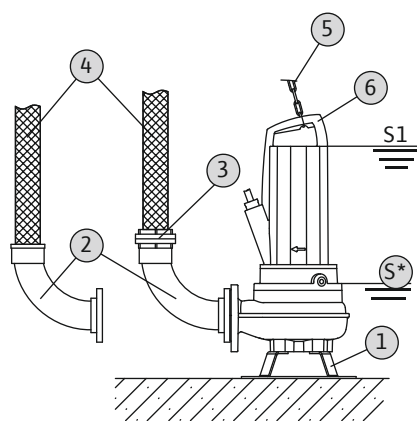


Fig. 12: 移动湿式安装

- ✓ 已安装水泵支脚。
  - ✓ 压力连接准备工作已完成：已安装带软管连接的弯管或者带 Storz 软管接头的弯管。
    1. 将提升设备通过一个卸扣固定在水泵接合点上。
    2. 提升水泵，将其放在指定的工作位置（集水坑、凹陷部分）。
    3. 将水泵放在坚固的基底上。小心！必须注意避免下沉！
    4. 铺设压力软管并在指定位置（比如排出口）进行固定。危险！一旦压力软管崩落或崩裂，可能导致人员（重度）受伤！必须把压力软管牢牢固定在出口。
    5. 专业铺设电源线。小心！切勿损坏电源线！
- ▶ 水泵安装完毕，专业电工可以开始进行电气连接。

#### 6.4.6 固定干式地坑安装

**注意****水位过低导致输送问题**

如果流体降至过低的液位，可能导致输送断流。继而在水力部件中形成气垫，导致出现不允许的运行行为。允许的最低水位必须至少达到水力部件外壳的上边缘！

采用干式地坑安装方式时，需要将运行空间划分为收集空间和机器空间。收集空间流通和收集流体，机器空间则安装水泵设备。水泵安装在机器空间，进水侧和出口侧与管道系统连接在一起。安装时注意下面几点：

- 进水侧和出口侧的管道系统必须能够自行支撑。水泵不可支撑管道系统。
- 将水泵无张力、无振动地连接在管道系统上。建议使用弹性连接件（补偿器）。
- 水泵不是自吸式产品，即流体必须自动进入或者在一定的供给压力下进入。收集空间的最低水位必须与水力部件外壳的上边缘等高！
- 最高环境温度：40 °C (104 °F)

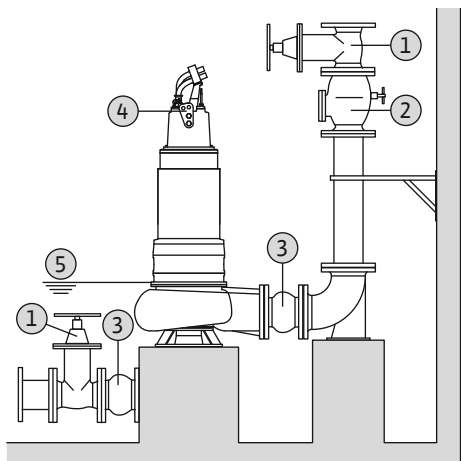


Fig. 13: 干式地坑安装

工作步骤

1	截止阀
2	止回阀
3	补偿器
4	提升设备接合点
5	收集空间的最低水位

- ✓ 机器空间/安装地点已准备完毕，可以开始安装。
- ✓ 已按规定安装管道系统且管道系统能自行支撑。
- 1. 将提升设备通过一个卸扣固定在水泵接合点上。
- 2. 提升水泵并在机器空间内定位。小心！定位水泵时，使电源线保持略微拉紧的状态！
- 3. 将水泵正确地固定在底座上。
- 4. 连接水泵和管道系统。注意！连接时注意保持无张力、无振动。必要时使用弹性连接件（补偿器）。
- 5. 将提升装置从水泵上松开。
- 6. 安排专业电工在机器空间内铺设电源线。
- ▶ 水泵安装完毕，专业电工可以开始进行电气连接。

6.4.7 液位控制装置



危险

安装错误可能会发生爆炸！

如果在潜在爆炸环境中安装液位控制装置，需要通过防爆切断继电器或齐纳安全栅连接信号变送器。连接错误可能会发生爆炸！安装专业电工负责连接工作。

通过液位控制装置可以确定当前液位，水泵根据液位自动接通/关闭。液位检测通过不同类型的传感器（浮子开关、压力和超声测量装置或电极）实现。使用液位控制装置时注意以下几点：

- 浮子开关可以自由移动！
- 不得低于允许的最低水位！
- 不得超过最大开关频率！
- 液位剧烈波动时，建议使用两个测量点进行液位控制。从而达到较大的开关差。

6.4.8 干转保护

干转保护用于防止出现水泵运行时没有流体，空气进入水力部件的情况。为此必须借助信号变送器确定允许出现的最低液位。只要达到规定的极值，就会立刻关闭水泵并发出相应的信号。一个干转保护装置可以为现有的液位控制装置扩展出一个附加测量点，或者作为一般关闭装置工作。视设备安全情况而定，可以自动或手动重启水泵。建议安装干转保护装置来提高运行可靠性。

6.5 电气连接



危险

小心触电死亡！

执行电气作业时不按规定操作，会发生电击致死事故！电气作业必须由专业电工按照当地的相关规定执行。



## 危险

### 接线错误可能发生爆炸！

- 始终在潜在爆炸环境以外对水泵进行电气连接。如果必须在潜在爆炸环境内接线，则在获得防爆认证的外壳（符合 DIN EN 60079-0 标准规定的点火保护等级）内进行！如不遵守，爆炸会导致生命危险！
- 在标记的接地端连接电位均衡器。接地端设在电源线区域内。电位均衡器必须使用符合当地法规的电缆截面。
- 接线工作须由专业电工执行。
- 进行电气连接时，也应注意本操作说明附录中防爆章节的详细信息！

- 电源连接必须与铭牌上的说明一致。
- 三相交流电机电源侧馈电具备顺时针旋转磁场。
- 按照当地法规的相关要求铺设接线电缆并按照芯线布局进行连接。
- 连接监控设备并检查功能是否正常。
- 按照当地法规的相关要求进行接地。

## 6.5.1 电源一侧的保险丝

### 断路器

断路器的规格和开关属性取决于所连接产品的额定电流。注意遵守当地相关法规。

### 电机保护开关

对于不带插头的产品，安装方应该准备一个电机保护开关！最低要求是配备一个符合本地规定，具备温度补偿、差分触发和重启锁定功能的热敏继电器/电机保护开关。针对反应灵敏的电网，安装方还应准备其他保护装置（比如超压、欠压或缺相继电器等）。

### 漏电断路器 (RCD)

遵守当地供电公司的相关规定！建议使用漏电断路器。

如果人员可能接触到产品和导电液体，需要对电路连接采取安全措施，装备一个漏电断路器 (RCD)。

## 6.5.2 保养工作

开始安装之前，先执行下列保养工作：

- 检查电机绕组的绝缘电阻。
- 检查温度传感器的电阻。
- 检查铅芯湿度电极（选配）的电阻。

如果测得的数值与规定参数存在偏差，说明：

- 电机或接线电缆内渗入潮气。
- 监控设备损坏。

如果发生故障，请联系客户服务部。

### 6.5.2.1 检查电机绕组的绝缘电阻

使用绝缘测试仪（测量直流电压 = 1000 V）测量绝缘电阻。遵守下列数值：

- 预调试时：绝缘电阻不得低于 20 MΩ。
- 进行其他测量时：绝缘电阻值必须大于 2 MΩ。

### 6.5.2.2 检查温度传感器的电阻

使用电阻表测量温度传感器的电阻。必须遵守下列测量值：

- 双金属片：测量值 = 0 Ohm（通过）。
- PTC 传感器（正温度系数电阻）：测量值取决于安装的传感器个数。PTC 传感器的冷态电阻介于 20 至 100 Ohm 之间。
  - 如果串联三个传感器，测量值介于 60 至 300 Ohm 之间。
  - 如果串联四个传感器，测量值介于 80 至 400 Ohm 之间。
- Pt100 传感器：Pt100 传感器在 0 °C (32 °F) 时的电阻值为 100 Ohm。在 0 °C (32 °F) 和 100 °C (212 °F) 之间时，温度每增加 1 °C (1.8 °F)，电阻值增加 0.385 Ohm。环境温度为 20 °C (68 °F) 时，电阻值达到 107.7 Ohm。

### 6.5.2.3 检查用于进行密封室监控的外部电极的电阻

使用电阻表测量电极的电阻。测得的数值必须趋向于“无穷大”。如果数值  $\leq 30$  kOhm，说明油中有水，换油！

## 6.5.3 连接三相交流电机

为三相交流电机供货时末端已露出。通过连接控制开关中的供电线接入电网。接线精确参数参见随附提供的接线图。电气连接工作须由专业电工执行！

注意！各芯线按照接线图命名。切勿切断芯线！芯线名称和接线图之间不存在其他分配关系。

直接启动时的电源连接芯线名称	
U, V, W	电源连接
PE (gn-ye)	接地

星三角启动时的电源连接芯线名称	
U1, V1, W2	电源连接 (绕组始端)
U2, V2, W2	电源连接 (绕组末端)
PE (gn-ye)	接地

### 6.5.4 连接监控设备

监控设备连接和规格精确参数，参见随附提供的接线图。电气连接工作须由专业电工执行！

注意！各芯线按照接线图命名。切勿切断芯线！芯线名称和接线图之间不存在其他分配关系。



#### 危险

#### 接线错误可能发生爆炸！

如未正确连接监控设备，潜在爆炸环境中存在生命危险！接线工作须由专业电工执行。在潜在爆炸环境中使用时，适用下列原则：

- 通过一个评测继电器连接电机过热保护！
- 温度限制装置引发的关闭操作，必须通过重启锁定功能实现！只有手动操作解锁按键之后，才允许重启！
- 外部电极（比如密封室监控设备）通过一个评测继电器与本安电路连接在一起！
- 注意本操作说明附录中防爆章节的详细信息！

#### 监控设备概述

	T 12 ... T 17	T 20	T 20.1	T 24 ... T 42	T 49, T 56	T 50, T 50.1, T 57.1, T 63.1	T 63.2, T 72
<b>内部监控设备</b>							
电机舱	•	•	-	-	-	-	-
端子室/电机舱	-	-	•	•	•	•	•
电机绕组	•	•	•	•	•	•	•
电机轴承	-	o	o	o	o	o	o
密封室	•	-	-	-	-	•	•
泄漏腔	-	-	•	-	-	•	•
振动传感器	-	-	-	o	o	o	o
<b>外部监控设备</b>							
密封室	o	o	o	o	o	o	o

• = 标配, - = 不可用, o = 可选

所有现有的监控设备必须始终处于连接状态！

#### 6.5.4.1 电机舱监控装置

通过一个评测继电器连接电极。建议使用“NIV 101/A”继电器。阈值为 30 kOhm。

芯线名称	
DK	电极接口

达到阈值之后，必须执行一次关闭操作！

## 6.5.4.2 端子室/电机舱监控

通过一个评测继电器连接电极。建议使用“NIV 101/A”继电器。阈值为 30 kOhm。

芯线名称	
DK	电极接口

达到阈值之后，必须执行一次关闭操作！

## 6.5.4.3 端子室/电机舱和密封室监控

通过一个评测继电器连接电极。建议使用“NIV 101/A”继电器。阈值为 30 kOhm。

芯线名称	
DK	电极接口

达到阈值之后，必须执行一次关闭操作！

## 6.5.4.4 电机绕组监控装置

## 配备双金属片

双金属片直接接入控制开关，或者通过一个评测继电器接入控制开关。  
连接值：最大 250 V(AC)，2.5 A， $\cos \varphi = 1$

双金属片芯线名称	
温度限制装置	
20, 21	双金属片接口
温度调节和限制装置	
21	高温接口
20	中温接口
22	低温接口

## 配备 PTC 传感器

通过一个评测继电器连接 PTC 传感器。建议使用“CM-MSS”继电器。阈值已预设。

PTC 传感器芯线名称	
温度限制装置	
10, 11	PTC 传感器接口
温度调节和限制装置	
11	高温接口
10	中温接口
12	低温接口

## 温度调节和限制装置的触发状态

视电机过热保护的规格而定，达到阈值后必须实现下列触发状态：

- 温度限制装置（1 温度回路）：  
达到阈值之后，必须执行一次关闭操作。
- 温度调节装置和限制装置（2 温度回路）：  
达到低温阈值后，可以通过自动重启功能执行一次关闭操作。达到高温阈值后，必须通过手动重启功能执行一次关闭操作。

注意附录中防爆章节的详细信息！

## 6.5.4.5 泄漏腔监控

浮子开关带有一个常闭无源触点。开关容量见随附的接线图。

芯线名称	
K20, K21	浮子开关接口

浮子开关响应后，必须发出警告或者执行关闭操作。

## 6.5.4.6 电机轴承监控

通过一个评测继电器关闭 Pt100 传感器。建议使用“DGW 2.01G”继电器。阈值为 100 °C (212 °F)。

芯线名称	
T1,	Pt100 传感器接口
T2	

达到阈值之后，必须执行一次关闭操作！

**6.5.4.7 监控运行条件决定的振动**

通过一个适用的评测继电器连接振动传感器。关于连接振动传感器的详细信息，参见评测继电器安装及操作说明。

极值必须在试运行阶段规定并记录在试运行记录中。一旦达到阈值，就必须关闭！

**6.5.4.8 密封室监控设备（外部电极）**

通过一个评测继电器连接外部电极。建议使用“NIV 101/A”继电器。阈值为 30 kOhm。

达到阈值之后，必须发出警告或者执行关闭操作。

**小心**

**连接密封室监控设备**

如果达到阈值后只发出一次警告，那么，进水可能导致水泵全盘受损。始终建议关闭水泵！

注意附录中防爆章节的详细信息！

**6.5.5 电机保护设置**

电机保护必须根据选择的启动模式进行设置。

**6.5.5.1 直接启动**

满负荷运行时，将电机保护开关参数设为额定电流（参见铭牌）。部分负荷运行时，建议设置的电机保护开关参数高于工况点所测得电流 5%。

**6.5.5.2 星三角启动**

电机保护的设置视安装情况而定：

- 电机保护安装在电机支线中：将电机保护设置为 0.58 x 额定电流。
- 电机保护安装在电源线中：将电机保护设置为额定电流。

星形连接的起动时间最长为 3 s。

**6.5.5.3 软启动**

满负荷运行时，将电机保护开关参数设为额定电流（参见铭牌）。部分负荷运行时，建议设置的电机保护开关参数高于工况点所测得电流 5%。此外还要注意以下几点：

- 电耗必须始终低于额定电流。
- 30 s 内完成启动和关闭。
- 达到正常运行模式后桥接电子启动器（软启动），避免出现功率损耗。

**6.5.6 使用变频器运行**

允许使用变频器运行设备。相关要求参见附录并注意遵守！

**7 试运行**



**警告**

不佩戴防护装备会导致脚受伤！

工作时存在（严重）受伤危险。穿安全鞋！

**7.1 工作人员资格鉴定**

- 电气作业：电气作业必须由专业电工执行。
- 操作/控制：操作人员必须了解整台设备的工作原理。

**7.2 运营者的责任**

- 在水泵上或者指定位置放置安装及操作说明。
- 为工作人员提供以其母语写成的安装及操作说明。
- 保证所有工作人员均已阅读安装及操作说明书并且理解其中内容。
- 设备方面的所有安全装置和紧急停机开关都处于激活状态，并经检查确认功能正常。
- 水泵适合于在规定的条件下使用。

**7.3 旋转方向监控（仅限三相交流电机）**

出厂时水泵设为适合顺时针旋转磁场的旋转方向并且经过检查。按照“电气连接”章节的相关说明进行连接。

### 检查旋转方向

由一名专业电工，使用旋转磁场检测仪检查电源连接处的旋转磁场。如果旋转方向正确，则在电源连接处必须存在一个顺时针旋转磁场。水泵不允许在逆时针旋转磁场中运行！小心！如果通过测试运行来检查旋转方向，注意遵守环境和运行条件！

### 旋转方向错误

如果旋转方向错误，如下改变连接：

- 采用直接启动方式的电机：两相互换。
- 采用星-三角启动方式的电机：互换两个绕组的连接（比如 U1/V1 和 U2/V2）。

## 7.4 在易爆环境中运行



### 危险

水力部件中的火花放电可能导致爆炸！

水力部件在运行过程中必须浸在水中（完全充满流体）。如果流量断开，或者水力部件浮出水面，可能会在水力部件中形成气垫。这可能引发爆炸，比如静电导致的火花放电！干转保护装置必须保证在相应的液位下关闭水泵。

### 标准电机概述

	T 12	T 13	T 17	T 17.2	T 20	T 20.1	T 24	T 30	T 34	T 42	T 49	T 50	T 50.1	T 56	T 63.1/1 63.2	T 72
ATEX 认证	o	o	o	o	o	o	o	o	o	o	-	-	o	o	o	-
FM 认证	o	o	o	o	o	o	o	o	o	o	o	-	o	o	o	-
CSA-Ex 认证	o	o	o	o	o	-	o	o	o	-	-	-	-	-	-	-

### 图片说明

-- 不存在/不可能，o = 可选，• = 标配

### IE3 电机（根据 IEC 60034）概述

	T 17 ...-E3	T 17.2 ...-E3	T 20.1 ...-E3	T 24 ...-E3	T 30 ...-E3	T 34 ...-E3	T 42 ...-E3	T 50.1 ...-E3	T 57.1 ...-E3	T 63.1 ...-E3	T 63.2 ...-E3
ATEX 认证	o	o	o	o	o	o	o	o	o	o	o
FM 认证	-	-	-	-	-	-	-	-	-	-	-
CSA-Ex 认证	-	-	-	-	-	-	-	-	-	-	-

### 图片说明

-- 不存在/不可能，o = 可选，• = 标配

在爆炸性气体中使用时，水泵铭牌上必须具有下列标识：

- 相应认证的防爆标识
- 防爆等级

关于防爆电缆的相关要求，参见本操作说明书的附录，并注意遵守要求！

### ATEX 认证

水泵适合在潜在爆炸环境中运行：

- 设备组：II
  - 类别：2，1 区和 2 区
- 水泵不可在 0 区使用！



**FM 认证**

水泵适合在潜在爆炸环境中运行：

- 防护等级：Explosionproof
  - 类别：Class I, Division 1
- 注意：如果根据 Division 1 布线，则也允许在 Class I, Division 2 中安装。

**按区 (Division) 分级的 CSA 防爆认证 (电机 T 12、T 13、T 17、T 17.2、T 20、T 34)**

水泵适合在潜在爆炸环境中运行：

- 防护等级：Explosion-proof
- 类别：Class 1, Division 1

**按区段 (Zone) 分级的 CSA 防爆认证 (电机 T 24、T 30)**

水泵适合在潜在爆炸环境中运行：

- 设备组：II
  - 类别：2, 1 区和 2 区
- 水泵不可在 0 区使用！

**7.5 接通前**

接通前检查下列几项：

- 检查安装操作是否符合规定，是否符合本地现行的相关法规：
  - 水泵是否接地？
  - 是否检查过电源线铺设情况？
  - 电气连接是否符合规定？
  - 机械部件是否正确固定？
- 检查液位控制装置：
  - 浮子开关能否自由移动？
  - 是否检查过开关液位（水泵开，水泵关，最低水位）？
  - 是否附加安装了干转保护装置？
- 检查工作条件：
  - 是否检查过流体的最低/最高温度？
  - 有无检查最大潜水深度？
  - 是否根据最低水位指定了运行模式？
  - 是否遵守最大开关频率？
- 检查安装地点/运行空间：
  - 出口侧管道系统有无沉积物？
  - 是否清洁过入口或泵井？有无沉积物？
  - 是否所有截止阀都已打开？
  - 有无规定和监控最低液位？

水力部件外壳必须全部充满流体，水力部件内不允许出现气垫。注意！如果设备内有形成气垫的危险，必须设计使用合适的排气装置！

**7.6 接通和关闭**

启动过程中会短时超过额定电流。运行过程中不得超过额定电流。小心！如果水泵未启动，立刻关闭水泵。重启水泵之前，先排除故障！

采用移动安装方式时，将水泵放在坚固的基底上。如果水泵翻倒，重启前需要先重新放置。如果基底条件较差，则将水泵牢固拧在基底上。

**水泵带裸露电缆端部**

水泵必须通过一个现场提供的独立操作台（通/断开关、控制开关）进行开关。

**水泵装有插头**

- 三相交流电规格：将插头插入插座后，水泵进入待机状态。通过 ON/OFF 开关接通和关闭水泵。

**水泵装有浮子开关和插头**

- 三相交流电规格：将插头插入插座后，水泵进入待机状态。通过插头上的两个开关控制水泵：
  - HAND/AUTO:规定是直接开关水泵 (HAND) 还是根据液位开关水泵 (AUTO)。
  - ON/OFF:启动和关闭水泵。

## 7.7 运行期间

**危险****水力部件中过压可能导致爆炸！**

在运行过程中，如果入口侧和压力侧的截止阀处于关闭状态，则水力部件中的流体会因输送运动而升温。随着升温，水力部件中会形成数巴的压力。此压力可能导致水泵爆炸！请确保在运行过程中所有截止阀都处于打开状态。一旦截止阀关闭，请立刻打开！

**警告****转动的部件可能会割伤身体！**

任何人不得在水泵工作区停留！转动的部件可能导致人员（重度）受伤！接通时以及在运行过程中，禁止任何人在水泵工作区停留。

**警告****高温表面可能导致烫伤！**

电机外壳在运行过程中温度较高，可能导致烫伤。关闭后使水泵冷却到环境温度！

**注意****水位过低导致输送问题**

如果流体降至过低的液位，可能导致输送断流。继而在水力部件中形成气垫，导致出现不允许的运行行为。允许的最低水位必须至少达到水力部件外壳的上边缘！

在水泵运行过程中，注意遵守下列主题相关的当地法规：

- 劳动保护
- 事故防范
- 电气机械使用

必须严格遵守运营者规定的操作人员工作范围。所有操作人员都有义务遵守工作范围和各项规定！

设计结构决定了离心泵装有不断转动又能随意接近的部件。运行条件决定了这些部件会形成锋利的边缘。警告！可能导致肢体被割伤和切断！必须定期检查以下几项：

**电机 T 12、T 13、T 17、T 17.2、T 20、T 20.1、T 24、T 30、T 34、T 42**

- 工作电压（额定电压 +/- 10 %）
- 频率（额定频率 +/- 2 %）
- 各相位之间的电耗（最大 5 %）
- 各个相位之间的电压差（最大 1 %）
- 最大开关频率
- 最低水浸取决于运行模式
- 入口：无空气进入。
- 液位控制装置/干转保护装置：切换点
- 安静/无振动运行
- 所有截止阀都处于打开状态

**电机 T 49、T 50.1、T 56、T 57、T 63.x、T 72**

- 工作电压（额定电压 +/- 5 %）
- 频率（额定频率 +/- 2 %）
- 各相位之间的电耗（最大 5 %）
- 各个相位之间的电压差（最大 1 %）
- 最大开关频率
- 最低水浸取决于运行模式
- 入口：无空气进入。
- 液位控制装置/干转保护装置：切换点
- 安静/无振动运行
- 所有截止阀都处于打开状态

### 在极限范围内运行

水泵可以短时（每天最长 15 分钟）在极限范围内运行。在极限范围内运行时，与运行数据的偏差会比较大。注意！禁止在极限范围内连续运行！这会导致水泵严重磨损，发生故障的几率变大！

在极限范围内运行时，适用下列参数：

- 工作电压（额定电压  $\pm 10\%$ ）
- 频率（额定频率  $\pm 5\%$ ）
- 各相位之间的电耗（最大  $6\%$ ）
- 各个相位之间的电压差（最大  $2\%$ ）

## 8 停止运行/拆卸

### 8.1 工作人员资格鉴定

- 操作/控制：操作人员必须了解整台设备的工作原理。
- 电气作业：电气作业必须由专业电工执行。
- 安装/拆卸工作：必须由专业人员执行，而且要求该人员接受过相关培训，了解工作中会用到的工具以及当前施工现场需要使用的固定材料。

### 8.2 运营者的责任

- 遵守本地现行的同业工伤事故保险联合会事故防范规定和安全规定。
- 遵守有关处理重物或在悬挂物之下工作的法律法规。
- 提供必要的防护装备并保证工作人员佩戴防护装备。
- 在封闭的空间内需提供足够的通风条件。
- 如果出现有毒气体或窒息气体汇集的情况，立刻采取对策！

### 8.3 停止运行

停止运行时关闭水泵，但是继续保持安装状态。从而确保水泵随时处于待机状态。

✓ 为了保护水泵免遭霜冻和冰冻危害，必须始终将水泵整个浸入流体中。

✓ 流体温度必须始终高于  $+3\text{ }^{\circ}\text{C}$  ( $+37\text{ }^{\circ}\text{F}$ )。

1. 在操作台上关闭水泵。
2. 为操作台采取安全措施（比如锁住主开关），防止意外重启。
  - ▶ 水泵现已停止运行，可以开始拆卸。

如果水泵在停止运行后继续保持安装状态，注意下列几项要求：

- 在停止运行的整个时段内，保证符合停止运行的前提条件。如果不能保证满足前提条件，请在停止运行后将水泵拆除！
- 如果长时间停止运行，需要定期（每月一次至每季度一次）执行一次持续 5 分钟的功能运行。小心！执行功能运行时，必须满足有效的运行条件。不允许进行空运行！如不遵守，可能导致全损！

### 8.4 拆卸



#### 危险

#### 危害健康的流体会导致危险！

如果在危害健康的流体中使用过水泵，则拆卸水泵后必须进行消毒处理，之后才能用于其他工作！有生命危险！遵守工作规程的相关规定！运营者必须保证工作人员已经收到并阅读工作规程！



#### 危险

#### 小心触电死亡！

执行电气作业时不按规定操作，会发生电击致死事故！电气作业必须由专业电工按照当地的相关规定执行。



#### 危险

#### 独自执行危险作业导致生命危险！

需要在竖井和狭窄空间内完成的工作，以及存在坠落危险的工作，这两个都是危险工种，不允许单人独自作业！为安全起见，必须有第二个人在场。

**警告**

高温表面可能导致烫伤！

电机外壳在运行过程中温度较高，可能导致烫伤。关闭后使水泵冷却到环境温度！

**注意**

请只使用技术方面毫无瑕疵的提升设备！

请只使用技术方面毫无瑕疵的提升设备提升和降低水泵。确保水泵在升降过程中不会卡住。切勿超过提升设备允许的最大承载能力！开始使用之前，先检查提升设备的功能是否正常！

**8.4.1 固定湿式安装**

- ✓ 水泵已停止运行。
- ✓ 入口侧和压力侧的截止阀已关闭。
  1. 将水泵断电。
  2. 将提升设备固定在接合点上。小心！切勿拖拽电源线！这会损坏电源线！
  3. 慢慢提起水泵，在导流管上方从运行空间内提出。小心！提升时可能损坏电源线！在提升过程中，使电源线保持略微拉紧的状态！
  4. 彻底清洁水泵（参见“清洁和消毒”段落）。危险！如果在危害健康的流体中使用水泵，需要对水泵进行消毒处理！

**8.4.2 移动湿式安装**

- ✓ 水泵已停止运行。
  1. 将水泵断电。
  2. 展开电源线，放在电机外壳上。小心！切勿拖拽电源线！这会损坏电源线！
  3. 从出水口上松开压力管。
  4. 将提升设备固定在接合点上。
  5. 从运行空间提出水泵。小心！放下时可能挤压和损坏电源线！放下时注意电源线！
  6. 彻底清洁水泵（参见“清洁和消毒”段落）。危险！如果在危害健康的流体中使用水泵，需要对水泵进行消毒处理！

**8.4.3 固定干式地坑安装**

- ✓ 水泵已停止运行。
- ✓ 入口侧和压力侧的截止阀已关闭。
  1. 将水泵断电。
  2. 展开电源线，固定在电机上。小心！固定时切勿损坏电源线！注意挤压和电缆断裂。
  3. 在进水口和出水口上松开管道系统。危险！危害健康的流体！管路和水力部件中可能仍有流体残留！放置收集罐，立刻接收滴落的液体，按规定对液体进行废弃处置。
  4. 将提升设备固定在接合点上。
  5. 从底座上松开水泵。
  6. 将水泵缓慢地从管道工程中提起，放在合适的安放位置。小心！放下时可能挤压和损坏电源线！放下时注意电源线！
  7. 彻底清洁水泵（参见“清洁和消毒”段落）。危险！如果在危害健康的流体中使用水泵，需要对水泵进行消毒处理！

### 8.4.4 清洁和消毒



#### 危险

##### 危害健康的流体会导致危险！

如果在危害健康的流体中使用过水泵，可能有生命危险！执行所有其他工作之前，需要对水泵进行消毒处理！进行清洁时需要佩戴下列防护装备：

- 封闭式护目镜
- 氧气面罩
- 防护手套

⇒ 所列设备是最低要求，注意工作规程中的相关规定！运营者必须保证工作人员已经收到并阅读工作规程！

- ✓ 已拆下水泵。
- ✓ 脏污的清洁用水已经按照本地实行的相关规定排入污水管道。
- ✓ 已准备消毒剂，供受到污染的水泵使用。
  1. 将提升设备固定在水泵接合点上。
  2. 将水泵提升到距离地面大约 30 cm (10 in) 的位置。
  3. 从上到下，向水泵喷射清水。注意！如果水泵受到污染，必须使用相应的消毒剂！严格遵守生产商规定的使用注意事项！
  4. 为了清洁叶轮和水泵内部空间，通过出水口向内部喷射水束。
  5. 彻底冲洗通道底部残留的污垢残渣。
  6. 使水泵干燥。

## 9 维护和维修



#### 危险

##### 危害健康的流体会导致危险！

如果在危害健康的流体中使用过水泵，则拆卸水泵后必须进行消毒处理，之后才能用于其他工作！有生命危险！遵守工作规程的相关规定！运营者必须保证工作人员已经收到并阅读工作规程！



#### 注意

##### 请只使用技术方面毫无瑕疵的提升设备！

请只使用技术方面毫无瑕疵的提升设备提升和降低水泵。确保水泵在升降过程中不会卡住。切勿超过提升设备允许的最大承载能力！开始使用之前，先检查提升设备的功能是否正常！

- 始终在干净且照明条件优良的地方执行维护工作。必须能够稳妥地放置水泵并采取安全措施。
  - 只执行本安装及操作说明中列出的维护工作。
  - 进行维护时穿戴以下防护装备：
    - 护目镜
    - 安全鞋
    - 安全手套
- 9.1 工作人员资格鉴定**
- 电气作业：电气作业必须由专业电工执行。
  - 保养工作：必须由熟悉所使用工作介质及其废弃处置的专业人员执行。此外工作人员还必须具有机械制造方面的基础知识。
- 9.2 运营者的责任**
- 提供必要的防护装备并保证工作人员佩戴防护装备。
  - 使用合适的容器收集工作介质并按规定进行废弃处理。
  - 按规定对使用过的防护服进行废弃处理。
  - 只使用生产商提供的原装部件。由于使用非原装部件而造成的任何损失，生产商不承担任何责任。
  - 一旦发生流体和工作介质泄露事故，立即收集泄漏物并按照当地现行法规进行废弃处理。

- 提供需要使用的工具。
- 使用易燃溶剂和清洁剂时，应禁止明火、明灯和吸烟。

### 9.3 螺旋塞的字样

M	电机舱螺旋塞
D	密封室螺旋塞
K	冷却系统螺旋塞
L	泄漏腔螺旋塞
S	冷凝水腔螺旋塞
F	油嘴螺旋塞

### 9.4 工作介质

#### 9.4.1 油类型

出厂时密封室内灌注了药用白油。换油时建议使用下列型号的油：

- Aral Autin PL\*
- Shell ONDINA 919
- Esso MARCOL 52\* 或 82\*
- BP WHITEMORE WOM 14\*
- Texaco Pharmaceutical 30\* 或 40\*

根据“USDA-H1”，标有“\*”的所有油品允许食用。

#### 9.4.2 润滑脂

使用下列润滑脂：

- Esso Unirex N3
- Tripol Molub-Alloy-Food Proof 823 FM（获得“USDA-H1”认证）

#### 9.4.3 加注量

加注量见随附的配置表。

### 9.5 维护间隔

为了保证设备可靠地运行，必须定期进行维护。在实际应用中，可以根据实际工作条件，确定与合同中所列间隔时间不同的维护间隔！如果在运行过程中出现剧烈振动，必须检查水泵和安装情况，不可拘泥于规定的维护间隔。

#### 9.5.1 一般工作条件下的维护间隔

8000 个运行小时或者最迟 2 年后

	目检接线电缆	目检附件	目检涂层和外壳是否磨损	检查监控设备的功能	密封室换油*	排空泄漏腔	为下部滚动轴承涂抹油脂	为上部滚动轴承涂抹油脂	排出冷凝水
T 12	•	•	•	•	•	-	-	-	-
T 13	•	•	•	•	•	-	-	-	-
T 17	•	•	•	•	•	-	-	-	-
T 17.2	•	•	•	•	•	-	-	-	-
T 20	•	•	•	•	•	-	-	-	-
T 20.1	•	•	•	•	•	•	-	-	-
T 24	•	•	•	•	•	-	-	-	•
T 30	•	•	•	•	•	-	-	-	•
T 34	•	•	•	•	•	-	-	-	•
T 42	•	•	•	•	•	-	-	-	•
T 49	•	•	•	•	•	-	-	-	•
T 50.1	•	•	•	•	•	•	•	-	•
T 56	•	•	•	•	•	-	-	-	•
T 57	•	•	•	•	•	•	•	-	•
T 63.1	•	•	•	•	•	•	•	-	•
T 63.2	•	•	•	•	•	•	•	-	•
T 72	•	•	•	•	•	•	•	•	•

• = 采取维护措施, - = 不采取维护措施

\*注意! 如果装有密封室监控装置, 就根据显示换油!

**15000** 个运行小时或者最迟 **10** 年后

- 大修

### 9.5.2 恶劣条件下的维护间隔

在恶劣条件下, 必要时必须缩短规定的维护间隔。恶劣或者繁重的生产条件是指以下情况:

- 流体中含有长纤维成分
- 涡流式入口 (例如由于空气进入、气蚀)
- 流体具有强度腐蚀或磨蚀性
- 流体生成大量气体
- 在不合适的工况点运行
- 存在压力冲击

在恶劣条件下使用水泵时, 建议签订维护合同。相关事宜请联系客户服务部。

## 9.6 维护措施



### 警告

#### 叶轮和进水口的锋利边缘!

叶轮和进水口可能形成锋利的边缘。导致四肢被割伤的危险! 必须佩戴防护手套, 防止出现切割受伤的情况。



### 警告

#### 不穿戴防护装备会导致手、脚和眼睛受伤!

工作时存在 (严重) 受伤危险。穿戴以下防护装备:

- 安全手套, 用以预防切割伤害
- 安全鞋
- 封闭式护目镜

开始采取维护措施之前, 必须满足下列前提条件:

- 水泵已冷却到环境温度。
- 彻底清洁水泵, 必要时进行消毒。

### 9.6.1 目检接线电缆

检查接线电缆的以下几方面:

- 气泡
- 裂纹
- 划痕
- 摩擦情况
- 挤压情况

一旦确定接线电缆受损, 立刻将水泵停止运行! 联系客户服务部更换接线电缆。只有经过专业排除故障之后, 才能重新将水泵投入运行!

小心! 接线电缆损坏可能导致水泵进水! 进水会导致水泵全损。

### 9.6.2 目视检查附件

附件必检项:

- 是否正确固定
- 功能是否正常
- 有无磨损症状, 比如振动导致的裂纹

一旦确定存在缺陷, 必须立刻维修或者更换附件。

### 9.6.3 目检涂层和外壳是否磨损

涂层和外壳部件不允许任何损坏。如果确定存在缺陷, 注意下面几项:

- 如果涂层损坏, 必须修复涂层。
- 如果外壳部件磨损, 请咨询客户服务部!

### 9.6.4 监控设备功能检查

检查电阻之前, 必须先将搅拌器冷却至环境温度!

#### 9.6.4.1 检查电机舱监控装置内部电极的电阻

使用电阻表测量电极的电阻。测得的数值必须趋向于“无穷大”。如果数值  $\leq 30 \text{ k}\Omega$ , 说明电机舱有水。请咨询客户服务部!

#### 9.6.4.2 检查端子室/电机舱监控装置内部电极的电阻

内部电极并联在一起，因此检查时请一起测量所有电极。

使用电阻表测量电极的电阻。测得的数值必须趋向于“无穷大”。如果数值  $\leq 30 \text{ k}\Omega$ ，说明端子室或电机舱有水。请咨询客户服务部！

#### 9.6.4.3 检查端子室/电机舱和密封室监控装置内部电极的电阻

内部电极并联在一起，因此检查时请一起测量所有电极。

使用电阻表测量电极的电阻。测得的数值必须趋向于“无穷大”。如果数值  $\leq 30 \text{ k}\Omega$ ，说明端子室、电机舱或密封室有水。更换密封室中的油并重新测量。

**注意！** 如果数值仍然  $\leq 30 \text{ k}\Omega$ ，请咨询客户服务部！

#### 9.6.4.4 检查温度传感器的电阻

使用电阻表测量温度传感器的电阻。必须遵守下列测量值：

- 双金属片：测量值 = 0  $\Omega$ （通过）。
- PTC 传感器（正温度系数电阻）：测量值取决于安装的传感器个数。PTC 传感器的冷态电阻介于 20 至 100  $\Omega$  之间。
  - 如果串联三个传感器，测量值介于 60 至 300  $\Omega$  之间。
  - 如果串联四个传感器，测量值介于 80 至 400  $\Omega$  之间。
- Pt100 传感器：Pt100 传感器在 0 °C (32 °F) 时的电阻值为 100  $\Omega$ 。在 0 °C (32 °F) 和 100 °C (212 °F) 之间时，温度每增加 1 °C (1.8 °F)，电阻值增加 0.385  $\Omega$ 。环境温度为 20 °C (68 °F) 时，电阻值达到 107.7  $\Omega$ 。

#### 9.6.4.5 检查用于进行密封室监控的外部电极的电阻

使用电阻表测量电极的电阻。测得的数值必须趋向于“无穷大”。如果数值  $\leq 30 \text{ k}\Omega$ ，说明油中有水，换油！

#### 9.6.5 给密封室换油



#### 警告

#### 工作介质承受高压！

电机内可能形成高达数巴的压力！打开螺旋塞时，这种压力会向外冲出。如果打开螺旋塞时不注意，它可能会高速弹出！请始终遵守以下指示，避免受伤：

- 遵守规定的工作步骤顺序。
- 缓慢转动螺旋塞，不要完全拧出。开始泄压之后（可听见空气鸣叫声或嘶嘶声），不要继续转动螺旋塞！
- 待泄压完成之后，完全拧出螺旋塞。
- 戴上封闭式护目镜。



#### 警告

#### 高温工作介质导致烫伤！

泄压时可能喷出高温工作介质，进而导致烫伤！请务必遵守以下指示，避免受伤：

- 将电机冷却到环境温度，之后打开螺旋塞。
- 佩戴封闭式护目镜或面部保护装置以及手套。



电机 T 12、T 13、T 17、T 17.2

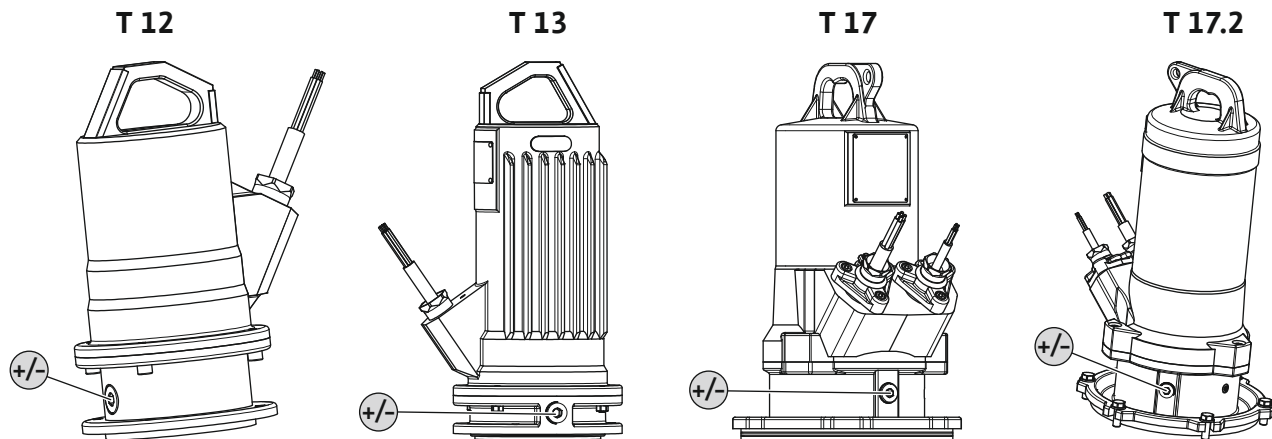


Fig. 14: 密封室：换油

+/- 为密封室注油/排油

- ✓ 防护装备就位！
- ✓ 水泵已拆卸并清洁（必要时消毒）。
- 1. 将水泵水平放置在坚固的底座上。螺旋塞朝上。警告！手可能被挤伤。请确保水泵不会翻倒或滑倒！
- 2. 缓慢转动螺旋塞，不要完全拧出。警告！电机过压！如果发出嘶嘶声或呼啸声，不要继续转动！等待，直到压力完全释放出来。
- 3. 待泄压完成之后，完全拧出螺旋塞。
- 4. 放置合适的容器用于收集工作介质。
- 5. 排放工作介质：转动水泵，直到开口朝下为止。
- 6. 检查工作介质：如果工作介质内有金属屑，请联系客户服务部！
- 7. 注入工作介质：转动水泵，直到开口朝上为止。通过开口注入工作介质。  
⇒ 遵守规定的工作介质类型和数量！
- 8. 清洁螺旋塞，装入新密封环，重新拧入。最大拧紧扭矩：**8 Nm (5.9 ft-lb)！**

电机 T 20、T 20.1、T 24

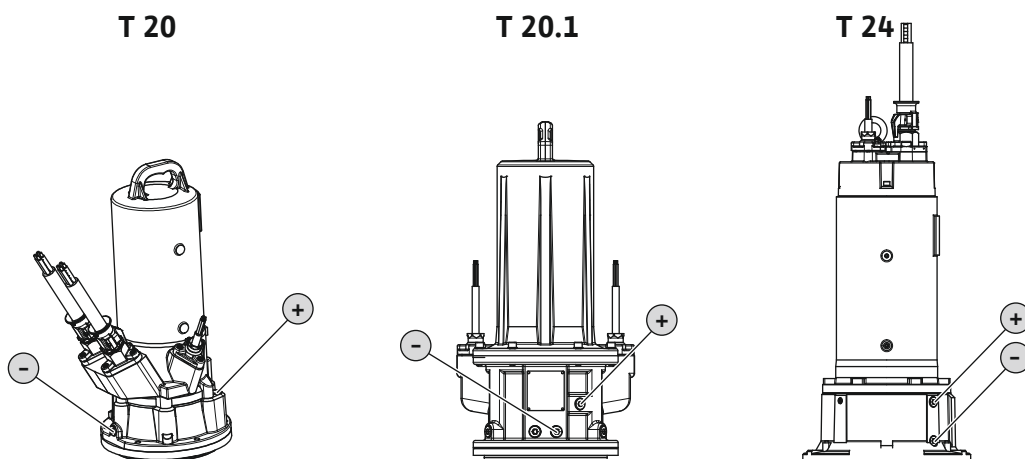


Fig. 15: 密封室：换油

+ 为密封室注油  
- 为密封室排油

- ✓ 防护装备就位！
- ✓ 水泵已拆卸并清洁（必要时消毒）。
- 1. 将水泵垂直放置在坚固的底座上。警告！手可能被挤伤。请确保水泵不会翻倒或滑倒！
- 2. 放置合适的容器用于收集工作介质。

3. 缓慢转动螺旋塞(+), 不要完全拧出。警告! 电机过压! 如果发出嘶嘶声或呼啸声, 不要继续转动! 等待, 直到压力完全释放出来。
4. 待泄压完成之后, 完全拧出螺旋塞(+).
5. 拧出螺旋塞(-) 并排出工作介质。如果排放口装有截止球阀, 则打开截止球阀。
6. 检查工作介质: 如果工作介质内有金属屑, 请联系客户服务部!
7. 如果排放口装有截止球阀, 则关闭截止球阀。
8. 清洁螺旋塞(-), 装入新密封环, 重新拧入。最大拧紧扭矩: **8 Nm (5.9 ft·lb)!**
9. 通过螺旋塞(+), 注入新的工作介质。  
⇒ 遵守规定的工作介质类型和数量!
10. 清洁螺旋塞(+), 装入新密封环, 重新拧入。最大拧紧扭矩: **8 Nm (5.9 ft·lb)!**

电机 T 30、T 34、T 42、T 49、T 50.1、T 56、T 57、T 63.x、T 72

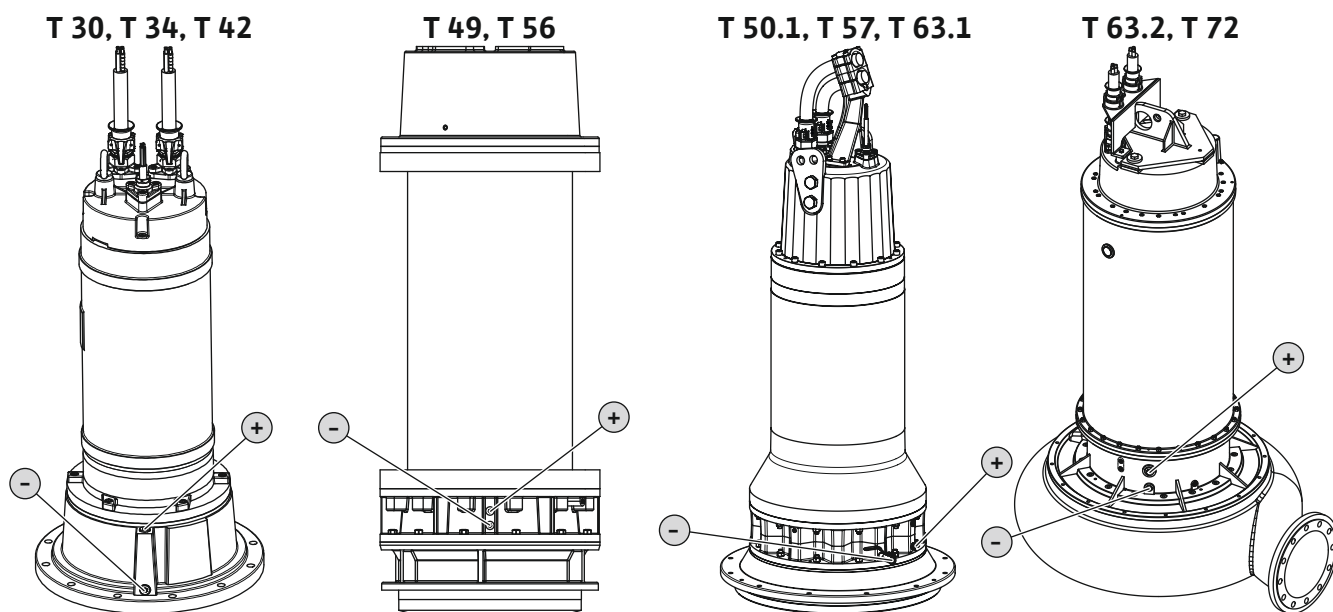


Fig. 16: 密封室：换油

+	为密封室注油
-	为密封室排油

- ✓ 防护装备就位!
  - ✓ 水泵已拆卸并清洁 (必要时消毒)。
1. 将水泵垂直放置在坚固的底座上。警告! 手可能被挤伤。请确保水泵不会翻倒或滑倒!
  2. 放置合适的容器用于收集工作介质。
  3. 缓慢转动螺旋塞(+), 不要完全拧出。警告! 电机过压! 如果发出嘶嘶声或呼啸声, 不要继续转动! 等待, 直到压力完全释放出来。
  4. 待泄压完成之后, 完全拧出螺旋塞(+).
  5. 拧出螺旋塞(-) 并排出工作介质。如果排放口装有截止球阀, 则打开截止球阀。
  6. 检查工作介质: 如果工作介质内有金属屑, 请联系客户服务部!
  7. 如果排放口装有截止球阀, 则关闭截止球阀。
  8. 清洁螺旋塞(-), 装入新密封环, 重新拧入。最大拧紧扭矩: **8 Nm (5.9 ft·lb)!**
  9. 通过螺旋塞(+), 注入新的工作介质。  
⇒ 遵守规定的工作介质类型和数量!
  10. 清洁螺旋塞(+), 装入新密封环, 重新拧入。最大拧紧扭矩: **8 Nm (5.9 ft·lb)!**

9.6.6 泄漏腔排水

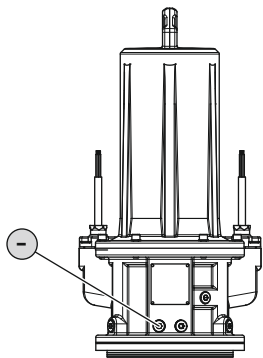


Fig. 17: 泄漏腔排水 : T 20.1

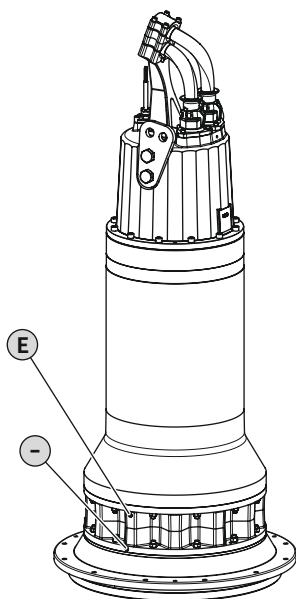


Fig. 18: 泄漏腔排水 : T 50.1、T 57、T 63.1

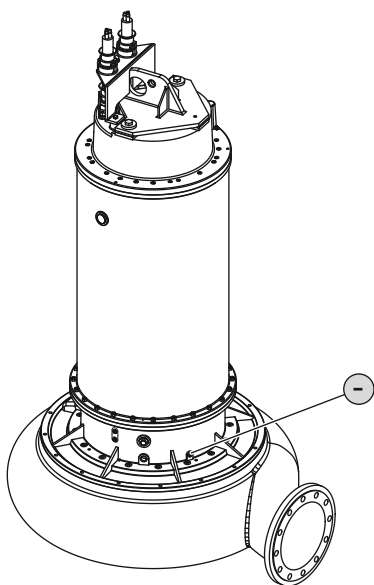


Fig. 19: 泄漏腔排水 : T 63.2、T 72

电机 T 20.1

- |   |       |
|---|-------|
| - | 排放泄漏液 |
|---|-------|
- ✓ 防护装备就位！
  - ✓ 水泵已拆卸并清洁（必要时消毒）。
1. 将水泵垂直放置在坚固的底座上。警告！手可能被挤伤。请确保水泵不会翻倒或滑倒！
  2. 放置合适的容器用于收集工作介质。
  3. 缓慢转动螺旋塞 (-)，不要完全拧出。警告！电机过压！如果发出嘶嘶声或呼啸声，不要继续转动！等待，直到压力完全释放出来。
  4. 待泄压完成之后，完全拧出螺旋塞 (-) 并排放工作介质。
  5. 清洁螺旋塞 (-)，装入新密封环，重新拧入。最大拧紧扭矩：8 Nm (5.9 ft·lb)！

电机 T 50.1、T 57、T 63.1

- |   |       |
|---|-------|
| E | 排气    |
| - | 排放泄漏液 |
- ✓ 防护装备就位！
  - ✓ 水泵已拆卸并清洁（必要时消毒）。
1. 将水泵垂直放置在坚固的底座上。警告！手可能被挤伤。请确保水泵不会翻倒或滑倒！
  2. 放置合适的容器用于收集工作介质。
  3. 缓慢转动螺旋塞 (E)，不要完全拧出。警告！电机过压！如果发出嘶嘶声或呼啸声，不要继续转动！等待，直到压力完全释放出来。
  4. 待泄压完成之后，完全拧出螺旋塞 (E)。
  5. 拧出螺旋塞 (-) 并排出工作介质。
  6. 清洁螺旋塞 (E) 和 (-)，装入新密封环，重新拧入。最大拧紧扭矩：8 Nm (5.9 ft·lb)！

电机 T 63.2、T 72

- |   |       |
|---|-------|
| - | 排放泄漏液 |
|---|-------|
- ✓ 防护装备就位！
  - ✓ 水泵已拆卸并清洁（必要时消毒）。
1. 将水泵垂直放置在坚固的底座上。警告！手可能被挤伤。请确保水泵不会翻倒或滑倒！
  2. 放置合适的容器用于收集工作介质。
  3. 缓慢转动螺旋塞 (-)，不要完全拧出。警告！电机过压！如果发出嘶嘶声或呼啸声，不要继续转动！等待，直到压力完全释放出来。
  4. 待泄压完成之后，完全拧出螺旋塞 (-) 并排放工作介质。
  5. 清洁螺旋塞 (-)，装入新密封环，重新拧入。最大拧紧扭矩：8 Nm (5.9 ft·lb)！

## 9.6.7 重新为滚动轴承涂上润滑脂

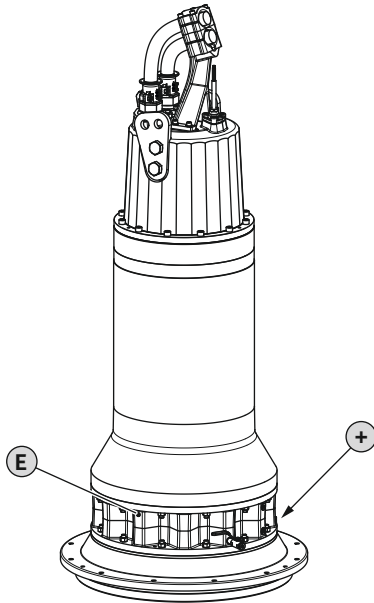


Fig. 20: 为滚动轴承涂抹油脂：T 50.1、T 57、T 63.1

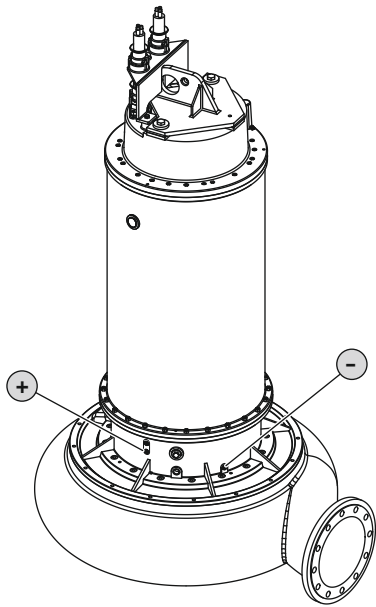


Fig. 21: 为滚动轴承涂抹油脂：T 63.2

## 电机 T 50.1、T 57、T 63.1

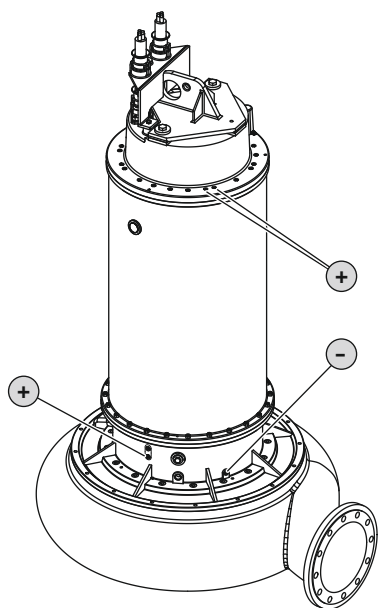
E	排气
+	用于涂抹油脂的油嘴（油脂量：200 g/7 oz）

- ✓ 防护装备就位！
- ✓ 水泵已拆卸并清洁（必要时消毒）。
  1. 将水泵垂直放置在坚固的底座上。警告！手可能被挤伤。请确保水泵不会翻倒或滑倒！
  2. 缓慢转动螺旋塞 (E)，不要完全拧出。警告！电机过压！如果发出嘶嘶声或呼啸声，不要继续转动！等待，直到压力完全释放出来。
  3. 待泄压完成之后，完全拧出螺旋塞 (E)。
  4. 拧出螺旋塞 (+)。油嘴设在螺旋塞后面。
  5. 用滑脂枪向油嘴内挤压油脂。
  6. 清洁螺旋塞 (E) 和 (+)，装入新密封环，重新拧入。最大拧紧扭矩：8 Nm (5.9 ft·lb)！

## 电机 T 63.2

-	泄漏腔螺旋塞（排气）
+	用于涂抹油脂的油嘴（油脂量：200 g/7 oz）

- ✓ 防护装备就位！
- ✓ 水泵已拆卸并清洁（必要时消毒）。
  1. 将水泵垂直放置在坚固的底座上。警告！手可能被挤伤。请确保水泵不会翻倒或滑倒！
  2. 缓慢转动泄漏腔螺旋塞 (-)，不要完全拧出。警告！电机过压！如果发出嘶嘶声或呼啸声，不要继续转动！等待，直到压力完全释放出来。
  3. 待泄压完成之后，完全拧出泄漏腔螺旋塞 (-)。
  4. 拧出螺旋塞 (+)。油嘴设在螺旋塞后面。
  5. 用滑脂枪向油嘴内挤压油脂。
  6. 清洁螺旋塞 (-) 和 (+)，装入新密封环，重新拧入。最大拧紧扭矩：8 Nm (5.9 ft·lb)！



电机 T 72

-	泄漏腔螺旋塞 (排气)
+	用于涂抹油脂的油嘴 下部轴承油脂量 : 160 g/6 oz 上部轴承油脂量 : 20 g/0.7 oz

- ✓ 防护装备就位！
  - ✓ 水泵已拆卸并清洁（必要时消毒）。
1. 将水泵垂直放置在坚固的底座上。警告！手可能被挤伤。请确保水泵不会翻倒或滑倒！
  2. 缓慢转动泄漏腔螺旋塞 (-)，不要完全拧出。警告！电机过压！如果发出嘶嘶声或呼啸声，不要继续转动！等待，直到压力完全释放出来。
  3. 待泄压完成之后，完全拧出泄漏腔螺旋塞 (-)。
  4. 拧出螺旋塞 (+)。油嘴设在螺旋塞后面。
  5. 用滑脂枪向油嘴内挤压油脂。
  6. 清洁螺旋塞 (-) 和 (+)，装入新密封环，重新拧入。最大拧紧扭矩：8 Nm (5.9 ft·lb)！

Fig. 22: 为滚动轴承涂抹油脂 : T 72

9.6.8 排出冷凝水

电机 T 24、T 30、T 34、T 42、T 49、T 56

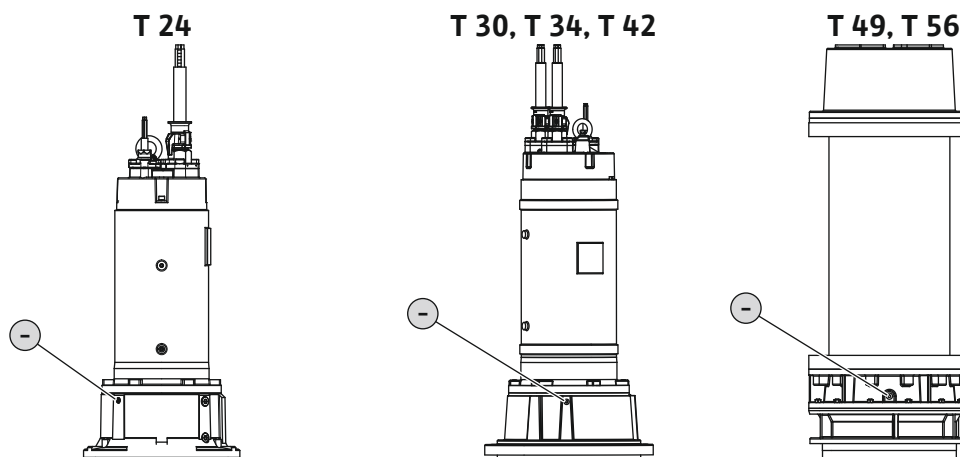


Fig. 23: 排出冷凝水 : T 24、T 30、T 34、T 42、T 49、T 56

-	排出冷凝水
---	-------

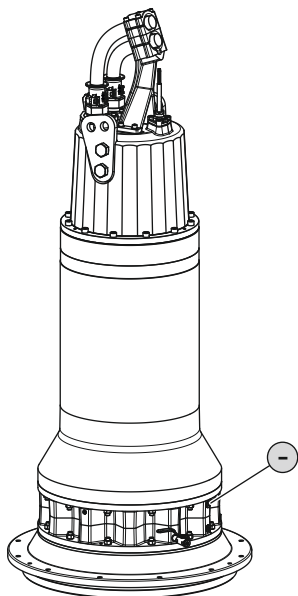


Fig. 24: 排出冷凝水 : T 50.1、T 57、T 63.1

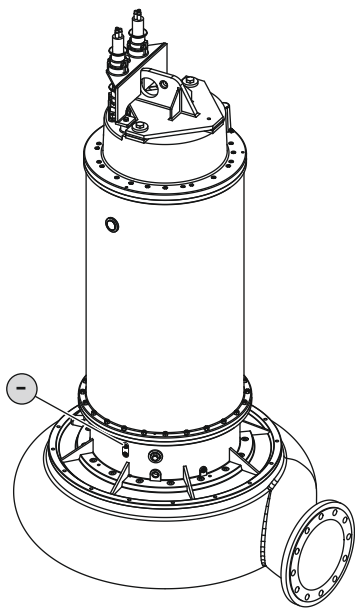


Fig. 25: 排出冷凝水 : T 63.2、T 72

## 9.7 维修工作

### 电机 T 50.1、T 57、T 63.1

#### - 排出冷凝水

- ✓ 防护装备就位！
  - ✓ 水泵已拆卸并清洁（必要时消毒）。
1. 将水泵垂直放置在坚固的底座上。警告！手可能被挤伤。请确保水泵不会翻倒或滑倒！
  2. 放置合适的容器用于收集工作介质。
  3. 缓慢转动螺旋塞(-)，不要完全拧出。警告！电机过压！如果发出嘶嘶声或呼啸声，不要继续转动！等待，直到压力完全释放出来。
  4. 待泄压完成之后，完全拧出螺旋塞(-)并排放工作介质。
  5. 清洁螺旋塞(-)，装入新密封环，重新拧入。最大拧紧扭矩：**8 Nm (5.9 ft-lb)！**

### 电机 T 63.2、T 72

#### - 排出冷凝水

- ✓ 防护装备就位！
  - ✓ 水泵已拆卸并清洁（必要时消毒）。
1. 将水泵垂直放置在坚固的底座上。警告！手可能被挤伤。请确保水泵不会翻倒或滑倒！
  2. 放置合适的容器用于收集工作介质。
  3. 缓慢转动螺旋塞(-)，不要完全拧出。警告！电机过压！如果发出嘶嘶声或呼啸声，不要继续转动！等待，直到压力完全释放出来。
  4. 待泄压完成之后，完全拧出螺旋塞(-)并排放工作介质。
  5. 清洁螺旋塞(-)，装入新密封环，重新拧入。最大拧紧扭矩：**8 Nm (5.9 ft-lb)！**



#### 警告

##### 叶轮和进水口的锋利边缘！

叶轮和进水口可能形成锋利的边缘。导致四肢被割伤的危险！必须佩戴防护手套，防止出现切割受伤的情况。



#### 警告

##### 不穿戴防护装备会导致手、脚和眼睛受伤！

工作时存在（严重）受伤危险。穿戴以下防护装备：

- 安全手套，用以预防切割伤害
- 安全鞋
- 封闭式护目镜

开始维修前，必须满足下列前提条件：

- 水泵已冷却到环境温度。
- 水泵已断电并采取安全措施防止意外重启。
- 彻底清洁水泵，必要时进行消毒。

维修工作一般原则：

- 如有流体和工作介质滴落，立刻进行收集！
- 必须更换 O 形圈、密封垫和螺钉锁紧装置！
- 注意附录给出的拧紧扭矩！
- 实施这些工作时，严禁使用蛮力！

### 9.7.1 螺钉锁紧装置使用提示

螺栓可以配备一个螺钉锁紧装置。出厂时有两种螺栓锁紧方式：

- 液体螺栓防松
- 机械螺栓防松

**必须更换螺钉锁紧装置！**

**液体螺栓防松**

使用中等强度的螺丝防松胶（比如 Loctite 243）实现液体螺栓锁紧。施加力度较大时，这种锁紧方式就会失效。如果螺栓锁紧松不开，必须将连接处加热到大约 300 °C (572 °F)。拆卸后彻底清洁部件。

**机械螺栓防松**

机械螺钉锁紧装置由两个 Nord-Lock 楔形锁紧垫圈构成。螺栓连接的这种锁紧方式通过夹紧力实现。Nord-Lock 螺钉锁紧装置一般仅用于 10.9 强度等级的镀久美特涂层的螺栓。禁止用于不锈钢螺栓！

### 9.7.2 允许执行哪些维修工作

- 更换水力部件外壳。
- SOLID G 和 Q 叶轮：补充调整进水口。

### 9.7.3 更换水力部件外壳



**危险**

**禁止拆卸叶轮！**

视叶轮直径而定，拆卸某些水泵的水力部件外壳时，必须拆下叶轮。开始任何工作之前，先检查是否有必要拆卸叶轮。如果确定需要拆卸，请联系客户服务部！叶轮拆卸工作必须由客户服务部或者获得授权的专业修理厂执行。

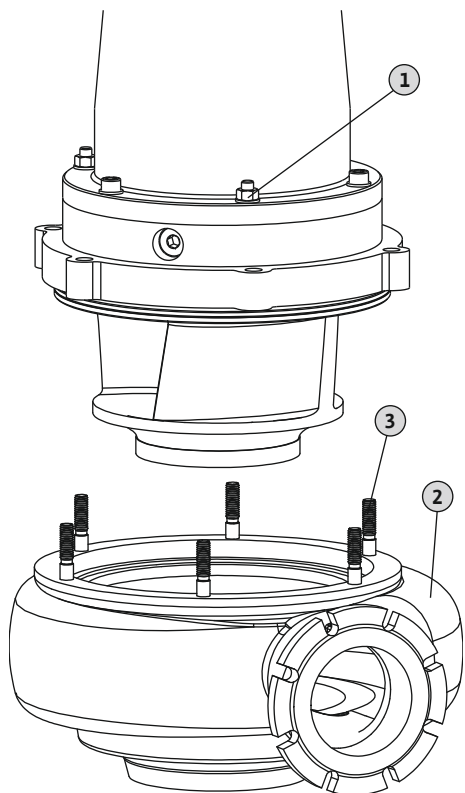


Fig. 26: 更换水力部件外壳

#### 9.7.4 SOLID G 和 Q 叶轮：补充调整进水口

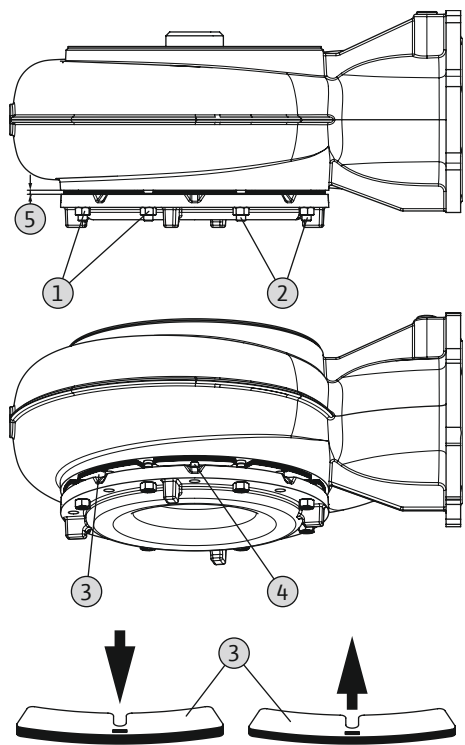


Fig. 27: SOLID G：补充调整间隙

1	用于固定电机/水力部件的六角螺母
2	水力部件外壳
3	螺栓

✓ 有具备足够承载能力的提升设备。

✓ 防护装备就位。

✓ 新水力部件外壳就位。

✓ 切勿拆卸叶轮！

1. 将提升设备和相应的提升装置固定在水泵接合点上。

2. 垂直放下水泵。

小心！如果水泵放下速度过快，可能会导致水力部件外壳磕碰进水口受损。将水泵慢慢放在进水口上！

注意！如果水泵不能平放在进水口上，则在下面放置相应的垫板。为了能够顺利提起电机，水泵必须垂直立起。

3. 在外壳上标记电机/水力部件的位置。

4. 拧松水力部件外壳上的六角螺母并将其拧出。

5. 慢慢提起电机并从螺栓上拔出。

小心！垂直提起电机，切勿歪斜！如果歪斜，会损坏螺栓！

6. 在新水力部件外壳上方摆动电机。

7. 慢慢降下电机。注意：电机/水力部件标记一致，螺栓精确穿入钻孔中。

8. 拧紧六角螺母，将电机和水力部件牢牢连接在一起。注意！注意附录中规定的拧紧扭矩！

► 水力部件外壳更换完毕，可以重新安装水泵。

**警告！** 如果需要临时存放水泵且需拆下提升设备，注意采取保护措施，防止水泵翻倒或滑倒！

1	用于固定进水口的六角螺母
2	螺栓
3	叠片铁芯
4	叠片铁芯紧固螺钉
5	进水口和水力部件外壳之间的间隙

✓ 有具备足够承载能力的提升设备。

✓ 防护装备就位。

1. 将提升设备和相应的提升装置固定在水泵接合点上。

2. 提起水泵，使水泵在悬在距离地面大约 50 cm (20 in) 处。

3. 拧松用于固定进水口的六角螺母。拧出六角螺母，直至其与螺栓齐平。

警告！手指可能被挤伤！进水口可能由于结壳效应而粘连在水力部件外壳上，可能会突然滑落。只交叉拧松螺母，从下方接触。注意戴安全手套！

4. 进水口在六角螺母上。如果进水口吸附在水力部件外壳上，则用楔子小心地松开进水口！

5. 清洁滑动面和拧入的叠片铁芯，必要时消毒。

6. 松开叠片铁芯上的螺栓并取下各叠片铁芯。

7. 慢慢拧紧三个交叉的六角螺母，直至进水口贴合在叶轮上。小心！只能用手拧紧六角螺母！如果六角螺母拧得过紧，可能损坏叶轮以及电机轴承！

8. 测量进水口和水力部件外壳之间的间隙。

9. 根据尺寸调整叠片铁芯，再插入一块金属板。

10. 重新拧出三个之前拧紧的六角螺母，直至其与螺栓齐平。

11. 重新放入叠片铁芯，用螺栓拧紧。

12. 交叉拧紧六角螺母，直至进水口贴合在叠片铁芯上，与之齐平。

13. 交叉拧紧六角螺母。注意附录中规定的拧紧扭矩！



14. 从下方探入进水口中，转动叶轮。如果间隙正确，叶轮会自动转动。如果间隙过小，则叶轮难以转动。需要重新调整。**警告！** 割伤肢体！进水口和叶轮会形成锋利的边缘。注意戴安全手套，防止割伤！

► 进水口已正确调整。可以重新安装水泵。

## 10 故障、原因和排除方法



### 危险

#### 危害健康的流体会导致危险！

如果水泵装在危害健康的流体中，可能有生命危险！工作时需要穿戴以下防护装备：

- 封闭式护目镜
- 氧气面罩
- 防护手套

⇒ 所列设备是最低要求，注意工作规程中的相关规定！运营者必须保证工作人员已经收到并阅读工作规程！



### 危险

#### 小心触电死亡！

执行电气作业时不按规定操作，会发生电击致死事故！电气作业必须由专业电工按照当地的相关规定执行。



### 危险

#### 独自执行危险作业导致生命危险！

需要在竖井和狭窄空间内完成的工作，以及存在坠落危险的工作，这两个都是危险工种，不允许单人独自作业！为安全起见，必须有第二个人在场。



### 警告

#### 禁止人员在水泵工作区域内停留！

水泵运行时可能会吸拉工作人员，导致（严重）受伤！因此禁止人员在其工作区域内停留。如果人员必须进入水泵工作区域，则必须将水泵停止运行并采取防护措施，以防被重新接通！



### 警告

#### 叶轮和进水口的锋利边缘！

叶轮和进水口可能形成锋利的边缘。导致四肢被割伤的危险！必须佩戴防护手套，防止出现切割受伤的情况。

#### 故障：水泵不启动

1. 电源线断开或者导线/电机绕组发生短路/对地短路。
  - ⇒ 安排专业电工检查接线和电机，必要时进行更换。
2. 触发保险丝、电机保护开关或监控设备
  - ⇒ 安排专业人员检查接线和监控设备，必要时进行改动。
  - ⇒ 安排专业电工按照技术规定安装电机保护开关和保险丝并进行设置，重置监控设备。
  - ⇒ 检查叶轮的灵活性，必要时清洁水力部件
3. 密封室监控设备（选配）电路断路（取决于接线）
  - ⇒ 参见“故障：机械密封泄漏，密封室监控设备报告故障并关闭水泵”

#### 故障：水泵启动后，很快就触发电机保护

1. 电机保护开关设置错误。

- ⇒ 安排专业电工检查触发器设置并进行修正。
- 2. 高电压降导致高电耗。
  - ⇒ 安排专业电工检查各相位的电压值。联系电网运营商。
- 3. 接线只有两相。
  - ⇒ 安排专业电工检查接线并进行修正。
- 4. 相位之间电压差异大。
  - ⇒ 安排专业电工检查各相位的电压值。联系电网运营商。
- 5. 旋转方向错误。
  - ⇒ 安排专业电工修正接线。
- 6. 水力部件堵塞导致高电耗。
  - ⇒ 清洁水力部件，检查入口。
- 7. 流体密度过高。
  - ⇒ 联系客户服务部。

#### 故障：水泵运行，无流量

1. 无流体。
  - ⇒ 检查入口，打开所有截止阀。
2. 入口堵塞。
  - ⇒ 检查入口，清除堵塞。
3. 水力部件堵塞。
  - ⇒ 清洁水力部件。
4. 出口侧管道系统或压力软管堵塞。
  - ⇒ 消除堵塞，必要时更换损坏的部件。
5. 间歇运行。
  - ⇒ 检查开关设备。

#### 故障：水泵启动，但是达不到工况点

1. 入口堵塞。
  - ⇒ 检查入口，清除堵塞。
2. 出口侧滑阀关闭。
  - ⇒ 完全打开所有截止阀。
3. 水力部件堵塞。
  - ⇒ 清洁水力部件。
4. 旋转方向错误。
  - ⇒ 安排专业电工修正接线。
5. 管道系统中形成气垫。
  - ⇒ 为管道系统排气。
  - ⇒ 频繁形成气垫：寻找进气口，避免进气，必要时在指定位置安装排气装置。
6. 水泵输送背压过高。
  - ⇒ 完全打开出口侧的所有截止阀。
  - ⇒ 检查叶轮形式，必要时使用其他形式的叶轮。联系客户服务部。
7. 水力部件出现磨损迹象。
  - ⇒ 检查部件（叶轮、进水口、水泵壳体）并联系客户服务部进行更换。
8. 出口侧管道系统或压力软管堵塞。
  - ⇒ 消除堵塞，必要时更换损坏的部件。
9. 流体生成大量气体。
  - ⇒ 联系客户服务部。
10. 接线只有两相。
  - ⇒ 安排专业电工检查接线并进行修正。

11. 运行期间，液位剧烈降低。
  - ⇒ 检查设备供应/容量。
  - ⇒ 检查液位控制装置的切换点，必要时进行调整。

**故障：水泵运行不安静，噪声大**

1. 不允许的工况点。
  - ⇒ 检查水泵布局和工况点，咨询客户服务部。
2. 水力部件堵塞。
  - ⇒ 清洁水力部件。
3. 流体生成大量气体。
  - ⇒ 联系客户服务部。
4. 接线只有两相。
  - ⇒ 安排专业电工检查接线并进行修正。
5. 旋转方向错误。
  - ⇒ 安排专业电工修正接线。
6. 水力部件出现磨损迹象。
  - ⇒ 检查部件（叶轮、进水口、水泵壳体）并联系客户服务部进行更换。
7. 电机轴承磨损。
  - ⇒ 联系客户服务部；水泵返厂维修。
8. 水泵已夹紧安装。
  - ⇒ 检查安装情况，必要时安装橡胶补偿器。

**故障：密封室监控设备报告故障或者关闭水泵**

1. 因存放时间较长或者温度波动大，形成了冷凝水。
  - ⇒ 在不使用铅芯湿度电极的情况下短时运行水泵（不超过 5 分钟）
2. 使用新机械密封时，入口处泄漏量增大。
  - ⇒ 换油。
3. 铅芯湿度电极的电缆损坏。
  - ⇒ 更换铅芯湿度电极。
4. 机械密封损坏。
  - ⇒ 联系客户服务部门。

**其他故障排除方法**

如果所述方法于故障排除无益，请联系客户服务部。客户服务部门可如下提供帮助：

- 通过电话或邮件提供帮助。
- 提供现场支持。
- 返厂检查和维修。

如果向客户服务部门提出支援请求，可能会产生费用！具体金额请咨询客户服务部。

<b>11</b>	<b>备件</b>	请在客户服务部订购备件。为了减少询问，同时避免出现订购错误，请提供序列号或商品号。保留技术变更权利！
<b>12</b>	<b>废弃处置</b>	
<b>12.1</b>	<b>油和润滑剂</b>	工作介质必须被收集到一个适当的容器中，并根据当地现行的指令废弃处置。一旦有介质滴落，立刻进行收集！
<b>12.2</b>	<b>防护服</b>	穿过的防护服必须根据当地现行的指令废弃处置。
<b>12.3</b>	<b>关于收集损耗的电气产品和电子产品的相关信息</b>	按规定废弃处置和正确回收这些产品，能避免环境污染、保护人身健康。

**注意****禁止作为生活垃圾废弃处置！**

在欧盟地区，该标志张贴在产品、包装或随附的资料中。它的意思是，相关的电气和电子产品不得作为生活垃圾废弃处置。

在按规定处理、回收和废弃处置相关旧产品时，要注意以下几点：

- 这些产品只能交给专门为此设立且获得认证的垃圾处理场。
- 注意当地现行的规定！

有关按规定废弃处置的信息，请咨询当地社区、最近的垃圾处理场或您购买产品的经销商。关于回收的详细信息请参见 [www.wilo-recycling.com](http://www.wilo-recycling.com)。

## 13 附件

### 13.1 拧紧扭矩

A2/A4 不锈钢螺栓			
螺纹	拧紧扭矩		
	Nm	kp m	ft·lb
M5	5.5	0.56	4
M6	7.5	0.76	5.5
M8	18.5	1.89	13.5
M10	37	3.77	27.5
M12	57	5.81	42
M16	135	13.77	100
M20	230	23.45	170
M24	285	29.06	210
M27	415	42.31	306
M30	565	57.61	417

配有 Nord-Lock 防松垫圈的镀久美特螺栓（强度等级 10.9）			
螺纹	拧紧扭矩		
	Nm	kp m	ft·lb
M5	9.2	0.94	6.8
M6	15	1.53	11
M8	36.8	3.75	27.1
M10	73.6	7.51	54.3
M12	126.5	12.90	93.3
M16	155	15.81	114.3
M20	265	27.02	195.5

### 13.2 使用变频器运行

电机可与变频器串联（遵守 IEC 60034-17 标准）运行。如果额定电压超过 415 V/50 Hz 或 480 V/60 Hz，必须咨询客户服务部。谐波导致额外升温，因此电机的额定功率必须比水泵所要求的功率高出约 10 %。如果变频器配备无高次谐波的输出端，可能可将功率储备降低 10 %。使用输出端滤波器可以减弱高次谐波。变频器必须与滤波器相互匹配。

根据电机额定电流对变频器进行配置。务必注意：尤其处于低转速范围的情况下，水泵工作时应该保持不晃动、不震动。否则机械密封会丧失密封性并损坏。此外，还应注意管路中的流速。如果流速过低，则水泵和连接管路中出现固体沉积物的危险会增加。测得的输送压力为 0.4 bar (6 psi) 时，建议最低流速为 0.7 m/s (2.3 ft/s)。

重要的是，水泵在整个调节范围内工作时，不得出现振动、共振、摆动力矩，噪音不能过大。电源受谐波影响，导致发动机噪音音量提升，属于正常现象。

为变频器设置参数时，注意遵守水泵和风扇二次特征曲线（U/f 特征曲线）的设置！U/f 特征曲线确保在频率低于额定频率（50 Hz 或 60 Hz）时，输出端电压能够

满足水泵的功率需求。新型变频器具有能源自动优化功能 - 这种自动机制的目标是达到相同的效果。进行变频器设置时，请注意变频器的安装及操作说明。

如果电机与变频器配套运行，视型号和安装条件而定，电机监控可能受到干扰。采取下列措施，可以降低或避免干扰：

- 遵守 IEC 60034-25 标准规定的电压峰值极值和上升速度极值。可能必须安装输出端滤波器。
- 改变变频器的脉冲频率。
- 如果内部密封室监控设备发生故障，使用外部双杆温度电极。

下列结构性措施也可以减少或者避免干扰：

- 干线和控制电缆具有单独的电源线（视电机规格而定）。
- 布线时，在干线和控制电缆之间留出足够的间距。
- 使用已屏蔽的电源线。

汇总

- 连续运行，直至达到额定频率（50 Hz 或 60 Hz） - 遵守最低流速。
- 注意与电磁兼容性规定有关的附加措施（选择变频器、使用滤波器等）。
- 不得超出电机的额定电流与额定转速。
- 必须能够连接电机自带的温度监控设备（双金属或 PTC 传感器）。

### 13.3 防爆认证

本章节详细介绍在爆炸性环境中运行水泵的相关信息。所有工作人员都必须阅读本章节内容。本章节仅适用于获得防爆认证的水泵！

#### 13.3.1 获得防爆认证的水泵标识

在爆炸性气体中使用时，水泵铭牌上必须具有下列标识：

- 相应认证的防爆标识
- 防爆等级
- 认证编号（取决于认证机构）

如果认证机构要求，会在产品铭牌上刻印认证编号。

#### 13.3.2 防护等级

电机的结构规格符合下列防护等级：

- 防火外壳 (ATEX)
- Explosionproof (FM)
- Flameproof enclosures (CSA-EX)

为了限制表面温度，电机至少装有一个温度限制装置（单电路温度监控装置）。此外还能进行温度调节（双电路温度监控）。

#### 13.3.3 规定用途



#### 危险

**输送爆炸性流体会导致爆炸！**

严禁输送纯粹形态下的易燃易爆流体（汽油、煤油等）。爆炸导致生命危险！水泵不是针对这类流体设计出的产品。

#### ATEX 认证

水泵适合在潜在爆炸环境中运行：

- 设备组：II
  - 类别：2, 1 区和 2 区
- 水泵不可在 0 区使用！

#### FM 认证

水泵适合在潜在爆炸环境中运行：

- 防护等级：Explosionproof
  - 类别：Class I, Division 1
- 注意：如果根据 Division 1 布线，则也允许在 Class I, Division 2 中安装。

按区 (Division) 分级的 CSA 防爆认证 (电机 T 12、T 13、T 17、T 17.2、T 20、T 34)

水泵适合在潜在爆炸环境中运行：

- 防护等级：Explosion-proof
- 类别：Class 1, Division 1

## 按区段 (Zone) 分级的 CSA 防爆认证 (电机 T 24、T 30)

水泵适合在潜在爆炸环境中运行：

- 设备组：II
  - 类别：2, 1 区和 2 区
- 水泵不可在 0 区使用！

## 13.3.4 电气连接



## 危险

## 小心触电死亡！

执行电气作业时不按规定操作，会发生电击致死事故！电气作业必须由专业电工按照当地的相关规定执行。

- 始终在潜在爆炸环境以外对水泵进行电气连接。如果必须在潜在爆炸环境内接线，则在获得防爆认证的外壳（符合 DIN EN 60079-0 标准规定的点火保护等级）内进行！如不遵守，爆炸会导致生命危险！接线工作须由专业电工执行。
- 所有位于“防火花区域”以外的监控设备，必须连接一个本安电路（比如 Ex-i 继电器 XR-4...）。

电机 T 12、T 13、T 17、T 17.2、T 20、T 20.1、T 24、T 30、T 34、T 42

- 电压公差最大不得超过  $\pm 10\%$ 。

电机 T 49、T 50.1、T 56、T 57、T 63.x、T 72

- 电压公差最大不得超过  $\pm 5\%$ 。

## 监控设备概述

	T 12 ... T 17	T 20	T 20.1	T 24 ... T 42	T 49、T 56	T 50、T 50.1、T 57.1、T 63.1	T 63.2、T 72
内部监控设备							
电机舱	•	-	-	-	-	-	-
端子室/电机舱	-	-	•	•	•	•	•
电机绕组	•	•	•	•	•	•	•
电机轴承	-	o	o	o	o	o	o
密封室	-	-	-	-	-	•	•
泄漏腔	-	-	•	-	-	•	•
振动传感器	-	-	-	o	o	o	o
外部监控设备							
密封室	o	o	o	o	o	o	o

• = 标配，- = 不可用，o = 可选

所有现有的监控设备必须始终处于连接状态！

## 13.3.4.1 电机舱监控

按照“电气连接”章节的相关说明进行连接。

## 13.3.4.2 端子室/电机舱监控

按照“电气连接”章节的相关说明进行连接。

## 13.3.4.3 端子室/电机舱和密封室监控

按照“电气连接”章节的相关说明进行连接。

## 13.3.4.4 电机绕组监控



## 危险

## 电机过热导致爆炸风险！

如果温度限制装置接线错误，可能由于电机过热而引起爆炸！温度限制装置必须连接一个手动重启锁定装置。也就是说，“解锁按钮”必须手动操作！

电机配备一个温度限制装置（单回路温度监控）。电机可以选配一个温度调节和限制装置（双回路温度监控）。

视电机过热保护规格而定，达到阈值后必须实现下列触发状态：

- 温度限制装置（1 温度回路）：  
达到阈值之后，必须使用重启锁定功能执行一次关闭操作。
- 温度调节装置和限制装置（2 温度回路）：  
达到低温阈值后，可以通过自动重启功能执行一次关闭操作。达到高温阈值后，必须通过重启锁定功能执行一次关闭操作。

小心！过热会导致电机损坏！自动重启时，注意遵守规定的最大开关频率和开关间歇时间！

连接电机过热保护

- 通过一个评测继电器连接双金属片。建议使用“CM-MSS”继电器。已预设阈值。  
连接值：最大 250 V(AC)，2.5 A， $\cos \varphi = 1$
- 通过一个评测继电器连接 PTC 传感器。建议使用“CM-MSS”继电器。已预设阈值。

#### 13.3.4.5 泄漏监控

通过一个评测继电器连接浮子开关！建议使用“CM-MSS”继电器。这里已预设阈值。

#### 13.3.4.6 电机轴承监控

按照“电气连接”章节的相关说明进行连接。

#### 13.3.4.7 密封室监控装置（外部电极）

- 通过一个获得防爆认证的评测继电器连接外部铅芯湿度电极！建议使用“XR-4...”继电器。  
阈值为 30 kΩ。
- 连接必须通过本安电路实现！

#### 13.3.4.8 在变频器上运行

- 变频器型号：脉冲宽度调制
- 连续运行：30 Hz 至额定频率（50 Hz 或 60 Hz）。遵守最低流速！
- 最小开关频率：4 kHz
- 接线端子板最大电压峰值：1350 V
- 变频器输出电流：最高为额定电流的 1.5 倍
- 最长过载时间：60 s
- 扭矩应用：二次水泵特征曲线  
可根据需求提供转速/扭矩特征曲线！
- 注意与电磁兼容性规定有关的附加措施（选择变频器、滤波器等）。
- 切勿超过电机的额定电流与额定转速。
- 必须能够连接电机自带的温度监控设备（双金属或 PTC 传感器）。
- 如果耐温等级标记为 T4/T3，则适用 T3 级别。

### 13.3.5 试运行



#### 危险

使用未获得防爆认证的水泵可能导致爆炸！

切勿在潜在爆炸环境中使用未获得防爆认证的水泵！爆炸导致生命危险！潜在爆炸环境中只能使用铭牌上标有相应的防爆标识的水泵。



#### 危险

水力部件中的火花放电可能导致爆炸！

水力部件在运行过程中必须浸在水中（完全充满流体）。如果流量断开，或者水力部件浮出水面，可能会在水力部件中形成气垫。这可能引发爆炸，比如静电导致的火花放电！干转保护装置必须保证在相应的液位下关闭水泵。



#### 危险

干转保护连接错误可能发生爆炸！

在易爆环境中运行水泵时，为干转保护装置配备单独的信号变送器（液位控制装置的冗余安全措施）。关闭水泵时，必须手动执行重启锁定！

- 潜在爆炸环境由运营者负责划分。
- 潜在爆炸环境中只允许使用获得相应的防爆认证的水泵。
- 获得防爆认证的水泵，铭牌上标有相应的标识。
- 切勿超过最高流体温度！

- 必须防止水泵空运行！为此，现场必须保证（干转保护）防止水力部件浮出水面。根据 DIN EN 50495 标准，类别 2 需要装备一台 SIL 1 级安全装置，而且硬件必须达到零容错标准。
- 13.3.6 维护和维修**
- 按规定进行保养。
  - 只执行本安装及操作说明中列出的保养工作。
  - 在防火花缝开展维修作业时，只能按照生产商提供的设计参数执行作业。不允许按照 DIN EN 60079-1 标准表 1 和表 2 的数值进行维修。
  - 请只使用生产商指定的螺旋塞，最低要求是强度等级达到 600 N/mm<sup>2</sup> (38.85 long tons-force/inch<sup>2</sup>)。
- 13.3.6.1 修复壳体涂层**
- 涂层厚度较大时，漆层可能产生静电。危险！有爆炸危险！静电在爆炸性环境中释放会导致爆炸！
- 修复壳体涂层时，厚度不可超过 2 mm (0.08 in)！
- 13.3.6.2 更换机械密封**
- 切勿交换流体侧和电机侧密封件！
- 13.3.6.3 更换接线电缆**
- 严禁更换接线电缆！



## Table of contents

<b>1</b>	<b>General information</b>	<b>59</b>
1.1	About these instructions	59
1.2	Copyright	59
1.3	Subject to change	59
1.4	Warranty	59
<b>2</b>	<b>Safety</b>	<b>59</b>
2.1	Identification of safety instructions	59
2.2	Personnel qualifications	61
2.3	Electrical work	61
2.4	Monitoring devices	61
2.5	Use in fluids hazardous to health	62
2.6	Transport	62
2.7	Installing/dismantling	62
2.8	During operation	62
2.9	Maintenance tasks	63
2.10	Operating fluid	63
2.11	Operator responsibilities	63
<b>3</b>	<b>Application/use</b>	<b>63</b>
3.1	Intended use	63
3.2	Improper use	64
<b>4</b>	<b>Product description</b>	<b>64</b>
4.1	Design	64
4.2	Monitoring devices	66
4.3	Operating modes	67
4.4	Operation with frequency converter	68
4.5	Operation in an explosive atmosphere	68
4.6	Rating plate	69
4.7	Type key	70
4.8	Scope of delivery	71
4.9	Accessories	71
<b>5</b>	<b>Transportation and storage</b>	<b>71</b>
5.1	Delivery	71
5.2	Transport	71
5.3	Storage	72
<b>6</b>	<b>Installation and electrical connection</b>	<b>73</b>
6.1	Personnel qualifications	73
6.2	Installation types	73
6.3	Operator responsibilities	73
6.4	Installation	73
6.5	Electrical connection	82
<b>7</b>	<b>Commissioning</b>	<b>87</b>
7.1	Personnel qualifications	87
7.2	Operator responsibilities	87
7.3	Direction of rotation check (for three-phase current motors only)	87
7.4	Operation in an explosive atmosphere	88
7.5	Before switching on	89
7.6	Switching on and off	89
7.7	During operation	90
<b>8</b>	<b>Shut-down/dismantling</b>	<b>91</b>
8.1	Personnel qualifications	91
8.2	Operator responsibilities	91
8.3	Shut-down	91
8.4	Removal	91

<b>9</b>	<b>Maintenance and repair</b>	<b>93</b>
9.1	Personnel qualifications	94
9.2	Operator responsibilities	94
9.3	Labelling of the screw plugs	94
9.4	Operating fluid	94
9.5	Maintenance intervals	94
9.6	Maintenance measures	95
9.7	Repairs	104
<b>10</b>	<b>Faults, causes and remedies</b>	<b>106</b>
<b>11</b>	<b>Spare parts</b>	<b>109</b>
<b>12</b>	<b>Disposal</b>	<b>110</b>
12.1	Oils and lubricants	110
12.2	Protective clothing	110
12.3	Information on the collection of used electrical and electronic products	110
<b>13</b>	<b>Appendix</b>	<b>110</b>
13.1	Tightening torques	110
13.2	Operation with frequency converter	111
13.3	Ex rating	111

## 1 General information

### 1.1 About these instructions

These installation and operating instructions are an integral part of the product. Read these instructions before commencing work and keep them in an accessible place at all times. Strict adherence to these instructions is a precondition for the intended use and correct operation of the product. All information and markings on the product must be observed.

The language of the original operating instructions is German. All other languages of these instructions are translations of the original operating instructions.

### 1.2 Copyright

These installation and operating instructions have been copyrighted by the manufacturer. Contents of any kind may not be reproduced or distributed, or used for purposes of competition and shared with others.

### 1.3 Subject to change

The manufacturer reserves the right to make technical modifications to the device or individual components. The illustrations used may differ from the original and are intended as an example representation of the device.

### 1.4 Warranty

The specifications in the current "General Terms and Conditions" apply to the warranty and the warranty period. These can be found at [www.wilo.com/legal](http://www.wilo.com/legal)

Any deviations must be contractually agreed and shall then be given priority.

#### **Claim to warranty**

If the following points are complied with, the manufacturer is obligated to rectify every qualitative or constructive flaw:

- The defects are reported in writing to the manufacturer within the warranty period.
- Application according to intended use.
- All monitoring devices are connected and tested before commissioning.

#### **Exclusion from liability**

Exclusion from liability excludes all liability for personal injury, material damage or financial losses. This exclusion ensues as soon as one of the following applies:

- Inadequate configuration due to inadequate or incorrect instructions by the operator or the client
- Non-compliance with installation and operating instructions
- Improper use
- Incorrect storage or transport
- Incorrect installation or dismantling
- Insufficient maintenance
- Unauthorised repairs
- Inadequate construction site
- Chemical, electrical or electro-chemical influences
- Wear

## 2 Safety

This chapter contains basic information for the individual phases of the life cycle. Failure to observe this information carries the following risks:

- Injury to persons from electrical, mechanical and bacteriological factors as well as electromagnetic fields
- Environmental damage from discharge of hazardous substances
- Property damage
- Failure of important functions of the product

Failure to observe the information contained herein will result in the loss of claims for damages.

**The instructions and safety instructions in the other chapters must also be observed!**

### 2.1 Identification of safety instructions

These installation and operating instructions set out safety instructions for preventing personal injury and damage to property. These safety instructions are shown differently:

- Safety instructions relating to personal injury start with a signal word, are **preceded by a corresponding symbol** and are shaded in grey.



**DANGER**

**Type and source of the danger!**

Consequences of the danger and instructions for avoidance.

- Safety instructions relating to property damage start with a signal word and are displayed **without** a symbol.

**CAUTION**

**Type and source of the danger!**

Consequences or information.

**Signal words**

- **DANGER!**  
Failure to observe the safety instructions will result in serious injuries or death!
- **WARNING!**  
Failure to follow the instructions can lead to (serious) injuries!
- **CAUTION!**  
Failure to follow the instructions can lead to property damage and a possible total loss.
- **NOTICE!**  
Useful information on handling the product

**Markups**

- ✓ Prerequisite
  1. Work step/list
    - ⇒ Notice/instructions
- ▶ Result

**Symbols**

These instructions use the following symbols:



Danger of electric voltage



Danger of bacterial infection



Danger of explosion



Danger – explosive atmosphere



General warning symbols



Warning of cutting injuries



Warning of hot surfaces



Warning of high pressure



Warning of suspended loads



Personal protective equipment: Wear a safety helmet



Personal protective equipment: Wear foot protection



Personal protective equipment: Wear hand protection



Personal protective equipment: Wear mouth protection



Personal protective equipment: Wear safety goggles



Autonomous work prohibited! A second person must be present.



Useful information

## 2.2 Personnel qualifications

Personnel must:

- Be instructed about locally applicable regulations governing accident prevention.
- Have read and understood the installation and operating instructions.

Personnel must have the following qualifications.

- Electrical work: A qualified electrician must carry out the electrical work.
- Installation/dismantling: The technician must be trained in the use of the necessary tools and fixation materials for the relevant construction site.
- Maintenance tasks: The technician must be familiar with the use of operating fluids and their disposal. In addition, the technician must have basic knowledge of mechanical engineering.

### **Definition of “qualified electrician”**

A qualified electrician is a person with appropriate technical education, knowledge and experience who can identify **and** prevent electrical hazards.

## 2.3 Electrical work

- Electrical work must be carried out by a qualified electrician.
- Before commencing work, disconnect the product from the mains and safeguard it from being switched on again.
- Observe applicable local regulations when connecting to the mains power supply.
- Adhere to the requirements of the local energy supply company.
- Train personnel in connecting electrics.
- Instruct personnel in options for switching off the device.
- Comply with the technical specifications contained in these installation and operating instructions and on the rating plate.
- Earth the device.
- Observe regulations for connection to the electrical switching system.
- Comply with the specifications on electro-magnetic compatibility when using electronic start-up controllers (e.g. soft starter or frequency converter). If required, take into account special measures (e.g. shielded cables, filters etc.).
- Replace defective connection cables. Contact customer service.

## 2.4 Monitoring devices

The following monitoring devices must be provided on-site:

### **Circuit breaker**

The size and switching characteristics of the circuit breakers must conform to the rated current of the connected product. Observe local regulations.

**Motor protection switch**

Make provision for an on-site motor protection switch for devices without a plug! The minimum requirement is a thermal relay/motor protection switch with temperature compensation, differential triggering and anti-reactivation device in accordance with the local regulations. In case of sensitive mains, make provision for the installation on-site of other protective equipment (e.g. overvoltage, undervoltage or phase failure relay, etc.).

**Residual-current device (RCD)**

Comply with the regulations of the local energy supply company! The use of a residual-current device is recommended.

If persons come into contact with the device and conductive fluids, secure the connection **with** a residual-current device (RCD).

**2.5 Use in fluids hazardous to health**

There is a danger of bacterial infection when using the device in fluids hazardous to health! Thoroughly clean and disinfect the device after dismantling and prior to further use. The operator must ensure the following:

- The following protective equipment is provided and worn when cleaning the device:
  - Closed safety goggles
  - Breathing mask
  - Protective gloves
- All persons are informed about the fluid, the associated danger and its correct handling!

**2.6 Transport**

- The following protective equipment must be worn:
  - Safety shoes
  - Safety helmet (when using lifting equipment)
- Always hold the handle to transport the device. Never pull the power supply cable!
- Only use legally specified and approved lifting gear.
- Select the lifting gear based on the existing conditions (weather, attachment point, load, etc.).
- Always attach the lifting gear to the attachment points (handle or lifting eyelet).
- The stability of the lifting equipment must be ensured during operation.
- When using lifting equipment, a second person must be present to coordinate the procedure if required (e.g. if the operator's field of vision is blocked).
- Persons are not permitted to stand beneath suspended loads. Do **not** carry suspended loads over workplaces where people are present.

**2.7 Installing/dismantling**

- Wear the following protective equipment:
  - Safety shoes
  - Safety gloves for protection against cuts
  - Safety helmet (when using lifting equipment)
- Locally applicable laws and regulations for work safety and accident prevention must be complied with.
- Disconnect the device from the mains and secure it against being switched on again without authorisation.
- All rotating parts must be at a standstill.
- Provide adequate aeration in closed rooms.
- When working in chambers and closed spaces, a second person must be present for safety reasons.
- Take immediate countermeasures if there is a build-up of toxic or suffocating gases!
- Clean the device thoroughly. Disinfect devices that are used in fluids hazardous to health!
- Make sure that there is no risk of explosion when carrying out any type of welding work or work with electrical devices.

**2.8 During operation**

- Wear the following protective equipment:
  - Safety shoes
  - Ear protection (in accordance with the notice of the work regulations)
- Work area of the device is not a recreational area. No persons are allowed in the work area during operation.
- The operator must immediately report any faults or irregularities to their line manager.
- If safety-endangering defects occur, the operator must immediately deactivate the device:
  - Malfunction of the safety and monitoring device
  - Damage to the housing parts
  - Damage to the electrical equipment

- Never reach into the suction port. The rotating parts can crush and sever limbs.
- If the motor emerges during operation, the motor housing can heat up to above 40 °C (104 °F).
- Open all gate valves in the piping on the suction and pressure side.
- Ensure minimum water submersion through dry-running protection.
- Under normal operating conditions, the sound pressure level of the device is below 85 dB(A). However, the actual sound-pressure level depends on several factors:
  - Installation depth
  - Installation
  - Fixation of accessories and pipe
  - Duty point
  - Immersion depth
- If the device is operated under normal operating conditions, the operator must measure the sound pressure. Ear protection must be worn for sound pressure levels of 85 dB(A) and above and this must be noted in the work regulations!

## 2.9 Maintenance tasks

- Wear the following protective equipment:
  - Closed safety goggles
  - Safety shoes
  - Safety gloves for protection against cuts
- Always carry out maintenance tasks outside the operating space/installation site.
- Only carry out maintenance tasks mentioned in these installation and operating instructions.
- Only original parts from the manufacturer may be used for maintenance and repairs. Use of parts other than the original parts releases the manufacturer from any liability.
- Collect any leakage of fluid and operating fluid immediately and dispose of it according to the locally applicable guidelines.
- Store tools at the designated locations.
- After completing work, reattach all safety and monitoring devices and check that they function properly.

### *Changing operating fluid*

In case of a defect, a pressure **of several bar can build up** in the motor! This pressure escapes when the screw plugs are **opened**. If screw plugs are opened without due caution, they can be ejected at high speed! To avoid injuries, observe the following instructions:

- Adhere to the prescribed sequence of work steps.
- Unscrew the screw plugs slowly, but never unscrew them completely. As soon as the pressure escapes (audible whistling or hissing of air), stop turning the screw plug any further.

**WARNING! Hot operating fluids can also spray out when the pressure is escaping. This can result in scalding! To avoid injuries, allow the motor to cool down to the ambient temperature before carrying out any work!**

- When the pressure has completely dissipated, fully unscrew the screw plug.

## 2.10 Operating fluid

In the sealing chamber, the motor is filled with white oil. Operating fluid must be replaced during regular maintenance work and disposed off according to the local guidelines.

## 2.11 Operator responsibilities

- Installation and operating instructions must be in a language which the personnel can understand.
- Make sure that the personnel is relevantly trained for the specified work.
- Provide the necessary protective equipment and make sure that the personnel wears it.
- Safety and information signs mounted on the device must be always legible.
- Train the personnel pertaining to the functioning of the system.
- Eliminate risk from electrical current.
- Equip hazardous components inside the system with an on-site guard.
- Identify and cordon off the work area.
- To ensure safe working practice, define the responsibilities of the employees.

Children and persons younger than 16 years or with reduced physical, sensory or mental capacities or limited experience are prohibited from handling the product! A technician must supervise persons younger than 18 years!

## 3 Application/use

### 3.1 Intended use

Submersible pumps are suitable for pumping:

- Sewage containing faeces
- Wastewater (with small amounts of sand and gravel)
- Process sewage
- Fluids with dry matter up to max. 8 %

3.2 Improper use



**DANGER**

**Explosion due to pumping of explosive fluids!**

Pumping of highly flammable and explosive fluids (gasoline, kerosene, etc.) in pure form is strictly prohibited. There is a risk of fatal injury due to explosion! The pumps are not designed for these fluids.



**DANGER**

**Danger due to fluids hazardous to health!**

If the pump is used in fluids hazardous to health, decontaminate the pump after dismantling and before carrying out any other work! There is a risk of fatal injury! Observe the specifications in the work regulations! The operator must make sure that the personnel have received and read the work regulations!

The submersible pumps must **not be used** for pumping:

- Drinking water
- Fluids containing hard components (such as stones, wood, metal, etc.)
- Fluids containing large quantities of abrasive contents (e.g. sand, gravel)

Intended use also includes compliance with this manual. Any other use is regarded as non-compliant with the intended use.

4 Product description

4.1 Design

Submersible sewage pump as submersible monobloc unit for continuous duty in wet well and dry well installation.

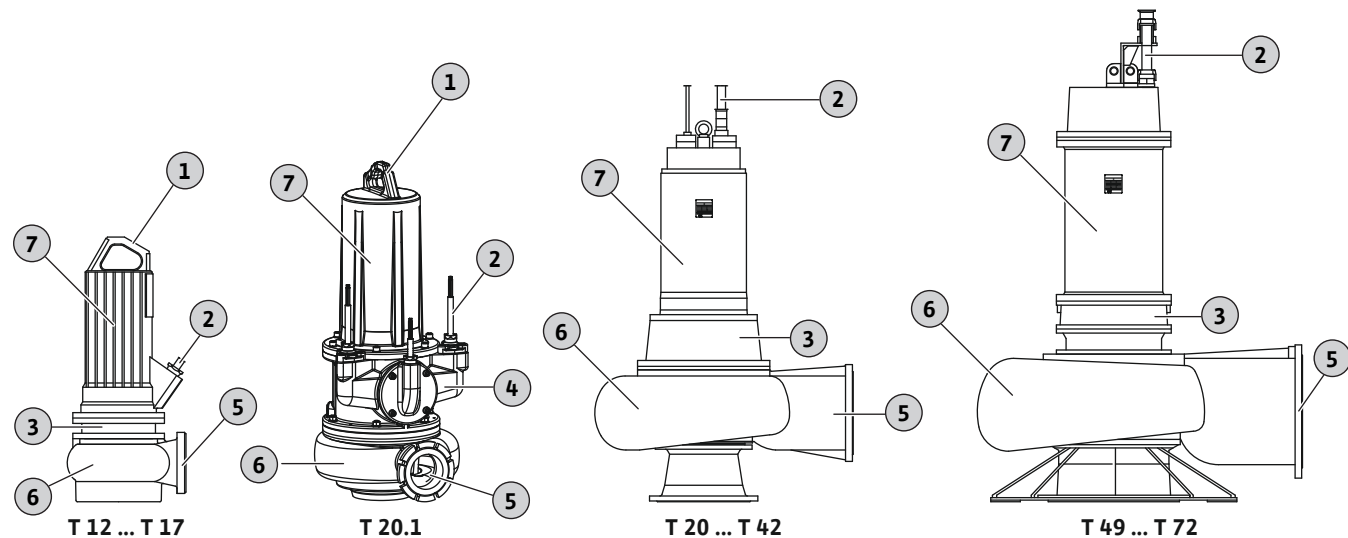


Fig. 1: Overview

1	Handle
2	Connection cable
3	Seal housing
4	Bearing housing
5	Pressure port
6	Hydraulics housing
7	Motor



#### 4.1.1 Hydraulics

Centrifugal hydraulics with different impeller shapes, horizontal flange connection on the pressure side, inspection cover as well as casing and impeller wear rings. The hydraulics are **not** self-priming, in other words, the fluid must flow in either automatically or with supply pressure.

##### **Impeller shapes**

The individual impeller shapes depend on the size of the hydraulics and not every impeller shape is available for every hydraulic system. The following is an overview of the different impeller shapes:

- Vortex impeller
- Single-channel impeller
- Two-channel impeller
- Three-channel impeller
- Four-channel impeller
- SOLID impeller, closed or half open

##### **Inspection cover (depending on the hydraulics)**

Additional opening on the hydraulics housing. This opening is used to remove clogging in the hydraulics.

##### **Casing and impeller wear rings (depending on the hydraulics)**

The suction port and impeller are subjected to the most stress when pumping. In the case of channel impellers, the gap between the impeller and the suction port is an important factor for a constant efficiency. The larger the gap between the impeller and the suction port, the higher the losses in the delivery rate. The efficiency decreases and the danger of clogging increases. In order to ensure long and efficient operation of the hydraulics, an impeller wear ring and/or casing wear ring is installed depending on the impeller and the hydraulics.

- Impeller wear ring  
The impeller wear ring is attached to the channel impellers and protects the incoming flow edge of the impeller.
- Casing wear ring  
The casing wear ring is installed in the suction port of the hydraulics and protects the incoming flow edge in the centrifugal chamber.

The two components can be replaced easily when worn.

#### 4.1.2 Motor

The system is driven by surface-cooled motors in three-phase current version. The motor is cooled by the fluid around it. The waste heat is transferred directly to the fluid or the ambient air via the motor housing. The motor may emerge during operation. Operation is possible in dry well installation depending on the motor power.

The motors are provided with different fittings depending on the motor size:

- Roller bearing: permanently lubricated and maintenance-free or regular re-greasing
- Condensate (condensation water) in motor: can be drained off

##### **Overview of motor fittings**

	T 12 ... T 20	T 20.1	T 24 ... T 42	T 49, T 56	T 50, T 50.1, T 57.1, T 63.1	T 63.2, T 72
Leakage chamber for condensate (condensation water)*	–	–	•	•	•	•
Roller bearing: permanently lubricated	•	•	•	•	–	–
Roller bearing: regular re-greasing	–	–	–	–	•	•

• = standard-equipped, – = not available

**\* NOTICE! In the case of Ex-rated motors, the condensation water cannot be drained off from all motors. Depending on the motor, the drainage screw would be placed in a spark-proof area!**

The connection cable is longitudinally watertight and has bare cable ends.

### 4.1.3 Seal

Different methods are used for the seal to the fluid and the motor compartment:

- Version "H": rotary shaft seal on the motor side, mechanical seal on the fluid side
- Version "G": two separate mechanical seals
- Version "K": two mechanical seals in a block seal cartridge made of stainless steel

Leakage from the seal is caught in the sealing chamber or leakage chamber:

- The sealing chamber accommodates any possible leakage of the seal on the fluid side.
- The leakage chamber accommodates any possible leakage of the seal on the motor side.

In the case of motors without an additional leakage chamber, the leakage from the seal on the motor side is taken up in the motor.

#### Overview of gasket and leakage chamber

	T 12 ... T 20	T 20.1	T 24 ... T 42	T 49, T 56	T 50, T 50.1, T 57.1, T 63.1	T 63.2, T 72
Sealing chamber	•	•	•	•	•	•
Leakage chamber	–	•	–	–	•	•

• = standard-equipped , – = not available

The sealing chamber between the mechanical seals is filled with medical white oil. The leakage chamber is empty.

### 4.1.4 Material

The following materials are used in the standard version:

- Pump housing: EN-GJL-250 (ASTM A48 Class 35/40B)
- Impeller: EN-GJL-250 (ASTM A48 Class 35/40B)
- Motor housing: EN-GJL-250 (ASTM A48 Class 35/40B)
- Seal on the motor side:
  - "H" = NBR (nitrile)
  - "G" = carbon/ceramic or SiC/SiC
  - "K" = SiC/SiC
- Seal on the fluid side: SiC/SiC
- Seal, static: NBR (nitrile)

The precise details of the materials are shown in the respective configuration.

## 4.2 Monitoring devices

#### Overview of monitoring devices

	T 12 ... T 17	T 20	T 20.1	T 24 ... T 42	T 49, T 56	T 50, T 50.1, T 57.1, T 63.1	T 63.2, T 72
Internal monitoring devices							
Motor compartment	•	•	–	–	–	–	–
Terminal room/motor compartment	–	–	•	•	•	•	•
Motor winding	•	•	•	•	•	•	•
Motor bearings	–	o	o	o	o	o	o
Sealing chamber	•	–	–	–	–	•	•
Leakage chamber	–	–	•	–	–	•	•
Vibration sensor	–	–	–	o	o	o	o
External monitoring devices							
Sealing chamber	o	o	o	o	o	o	o

• = standard-equipped , – = not available, o = optional

**All the monitoring devices fitted must always be connected!****Monitoring of motor compartment**

The motor compartment monitoring protects the motor winding from short-circuits. The moisture is measured by an electrode.

**Monitoring the terminal room and motor compartment**

The terminal room and motor compartment monitoring protects the motor terminals and winding from short-circuits. An electrode in both the terminal room and the motor compartment measures the moisture content.

**Monitoring of motor winding**

The thermal motor monitoring protects the motor winding from overheating. Temperature limiting with bimetallic strip is fitted as standard.

As an option, the temperature can also be measured with a PTC sensor. The thermal motor monitoring can also be designed as temperature control. This allows the measurement of two temperatures. When the low temperature is reached, an automatic reactivation can be initiated after cooling the motor. When the high temperature is reached, the unit must deactivate with reactivation lock.

**Internal monitoring of sealing chamber**

This sealing chamber is equipped with an internal pencil electrode. The electrode registers fluid ingress through the mechanical seal on the fluid side. An alarm or deactivation of the pump can therefore take place by pump control.

**External monitoring of the sealing chamber**

The sealing chamber can be equipped with an external pencil electrode. The electrode registers fluid ingress through the mechanical seal on the fluid side. An alarm or deactivation of the pump can therefore take place by pump control.

**Leakage chamber monitoring**

The leakage chamber is equipped with a float switch. The float switch registers fluid ingress through the mechanical seal on the motor side. An alarm or deactivation of the pump can therefore take place by pump control.

**Monitoring of motor bearing**

The thermal monitoring of the motor bearing protects the roller bearings against overheating. Pt100 sensors are used for temperature measurement.

**Monitoring of vibration occurring due to operation**

The pump can be equipped with a vibration sensor. The vibration sensor registers the vibration that occurs during operation. An alarm or deactivation of the pump must be effected via the pump control depending on the differing limit values.

**NOTICE! The limit values are set on-site during commissioning and recorded in the commissioning log!**

**4.3 Operating modes****Operating mode S1: Continuous duty**

The pump can operate continuously at the rated load without exceeding the permissible temperature.

**Operating mode: Non-immersed operation**

The “non-immersed operation” operating mode describes the possibility of the motor emerging during the drainage pumping sequence. This allows a further lowering of the water level as far as the upper edge of the hydraulics.

	T 12 ... T 17	T 20	T 20.1	T 24 ... T 42	T 49, T 56	T 50, T 50.1 T 57.1, T 63.1	T 63.2, T 72
Non-immersed operation allowed	Yes	No	Yes	Yes	No	Yes	No

Observe the following points during non-immersed operation:

- Operating mode “non-immersed” indicated  
The motor emerging in “non-immersed” operating mode is permissible.
- Operating mode: “non-immersed” **not** indicated  
If the motor is fitted with a temperature controller (2-circuit temperature monitoring), emergence of the motor is permitted. Automatic reactivation can be initiated after the motor has cooled down using the low temperature. The unit is forced to deactivate with reactivation lock once the high-temperature has been reached. **CAUTION! To protect the motor winding from overheating, the motor must be equipped with a temperature controller! If only one temperature limiter is installed, the motor must not emerge during operation.**
- Max. fluid and ambient temperature: The maximum ambient temperature corresponds to the maximum fluid temperature shown on the rating plate.  
**CAUTION! The following applies to motor T 12: During non-immersed operation, the fluid temperature and ambient temperature must not exceed 30 °C!**

**4.4 Operation with frequency converter**

Operation on the frequency converter is permitted. Refer to the appendix for the relevant requirements!

**4.5 Operation in an explosive atmosphere**

**Overview of standard motors**

	T 12	T 13	T 17	T 17.2	T 20	T 20.1	T 24	T 30	T 34	T 42	T 49	T 50	T 50.1	T 56	T 63.1/T 63.2	T 72
ATEX approval	o	o	o	o	o	o	o	o	o	o	-	-	o	o	o	-
FM approval	o	o	o	o	o	o	o	o	o	o	o	-	o	o	o	-
CSA-Ex approval	o	o	o	o	o	-	o	o	o	-	-	-	-	-	-	-

**Key**

- = not available/possible, o = optional, • = as standard

**Overview of IE3 motors (derived from IEC 60034)**

	T 17 ...-E3	T 17.2 ...-E3	T 20.1 ...-E3	T 24 ...-E3	T 30 ...-E3	T 34 ...-E3	T 42 ...-E3	T 50.1 ...-E3	T 57.1 ...-E3	T 63.1 ...-E3	T 63.2 ...-E3
ATEX approval	o	o	o	o	o	o	o	o	o	o	o
FM approval	-	-	-	-	-	-	-	-	-	-	-
CSA-Ex approval	-	-	-	-	-	-	-	-	-	-	-

**Key**

- = not available/possible, o = optional, • = as standard

For use in explosive atmospheres, the pump must be marked as follows on the rating plate:

- “Ex” symbol of the corresponding approval
- Ex classification

**For the relevant requirements, refer to the explosion protection chapter in the appendix of these installation and operating instructions!**

**ATEX approval**

The pumps are suitable for operation in potentially explosive atmospheres:

- Device group: II
- Category: 2, zone 1 and zone 2

**These pumps must not be used in zone 0!**

**FM approval**

The pumps are suitable for operation in potentially explosive atmospheres:

- Protection class: Explosionproof
- Category: Class I, Division 1

Notice: If the cabling is carried out according to Division 1, installation in Class I, Division 2 is also permitted.

**CSA-Ex-rating according to division (Motor T 12, T 13, T 17, T 17.2, T 20, T 34)**

The pumps are suitable for operation in potentially explosive atmospheres:

- Protection class: Explosion-proof
- Category: Class 1 Division 1

**CSA-Ex-rating according to zone (Motor T 24, T 30)**

The pumps are suitable for operation in potentially explosive atmospheres:

- Device group: II
- Category: 2, zone 1 and zone 2

**These pumps must not be used in zone 0!**

## 4.6 Rating plate

The following is an overview of the abbreviations and associated data on the rating plate:

Rating plate designation	Value
P-Typ	Pump type
M-Typ	Motor type
S/N	Serial number
Art.-No.	Article number
MFY	Date of manufacture*
$Q_N$	Volume flow duty point
$Q_{max}$	Max. volume flow
$H_N$	Delivery head duty point
$H_{max}$	Max. delivery head
$H_{min}$	Min. delivery head
n	Speed
T	Max. fluid temperature
IP	Protection class
I	Rated current
$I_{ST}$	Starting current
$I_{SF}$	Rated current at service factor
$P_1$	Power consumption
$P_2$	Rated power
U	Rated voltage
f	Frequency
$\cos \varphi$	Motor efficiency
SF	Service factor
$OT_S$	Operating mode: immersed
$OT_E$	Operating mode: non-immersed
AT	Starting mode
$IM_{org}$	Impeller diameter: original
$IM_{korr}$	Impeller diameter: corrected

\*The date of manufacture is stated in accordance with ISO 8601: JJJJWww

- JJJJ = year
- W = abbreviation for week

- ww = calendar week

## 4.7 Type key

### Examples:

Wilo-EMU FA 15.52-245E + T 17.2-4/24HEX-E3

Wilo-Rexa SUPRA-V10-736A + T 17.2-4/24HEX-E3

Wilo-Rexa SOLID-Q10-345A + T 17.2-4/24HEX-E3

### Hydraulics type key "EMU FA"

FA	Sewage pump
15	x10 = nominal diameter of pressure connection
52	Internal performance coefficient
245	Original impeller diameter (only for standard variants, omitted for configured pumps)
D	Impeller shape: W = vortex impeller E = single-channel impeller Z = two-channel impeller D = three-channel impeller V = four-channel impeller T = closed two-channel impeller G = half-open single-channel impeller

### Hydraulics type key "Rexa SUPRA"

SUPRA	Sewage pump
V	Impeller shape: V = vortex impeller C = single-channel impeller M = multi-channel impeller
10	x10 = nominal diameter of pressure connection
73	Internal performance coefficient
6	Characteristic curve number
A	Material version: A = standard version B = corrosion protection 1 D = abrasion protection 1 X = special configuration

### Hydraulics type key "Rexa SOLID"

SOLID	Sewage pump with SOLID impeller
Q	Impeller shape: T = closed two-channel impeller G = semi-open single-channel impeller Q = half-open two-channel impeller
10	x10 = nominal diameter of pressure connection
34	Internal performance coefficient
5	Characteristic curve number
A	Material version: A = standard version B = corrosion protection 1 D = abrasion protection 1 X = special configuration

### Motor type key

T	Surface-cooled motor
17	Size
2	Configuration version
4	Number of poles
24	Package length in cm
H	Seal version
Ex	Ex-rated

**Examples:**

Wilo-EMU FA 15.52-245E + T 17.2-4/24HEX-E3

Wilo-Rexa SUPRA-V10-736A + T 17.2-4/24HEX-E3

Wilo-Rexa SOLID-Q10-345A + T 17.2-4/24HEX-E3

E3

IE-efficiency class (derived from IEC 60034-30)

**4.8 Scope of delivery****Standard pump**

- Pump with bare cable end
- Installation and operating instructions

**Configured pumps**

- Pump with bare cable end
- Cable length as per customer request
- Mounted accessories, e.g. external pencil electrode, pump support foot, etc.
- Installation and operating instructions

**4.9 Accessories**

- Suspension unit
- Pump support foot
- Special versions with Ceram coatings or special materials
- External pencil electrode for sealing chamber control
- Level control devices
- Fixation accessories and chains
- Switchgear, relays and plugs

**5 Transportation and storage****5.1 Delivery**

After receiving the shipment, this must be checked immediately for defects (damage, completeness). Defects must be noted on the freight documentation! Furthermore, defects must be notified to the transport company or the manufacturer immediately on the day of receipt of shipment. Subsequently notified defects can no longer be asserted.

**5.2 Transport****WARNING****Standing under suspended loads!**

Never allow anyone to stand under suspended loads! Danger of (serious) injuries caused by falling parts. Loads may not be carried over work places where people are present!

**WARNING****Head and foot injuries due to a lack of protective equipment!**

Danger of (serious) injuries during work. Wear the following protective equipment:

- Safety shoes
- Safety helmet must be worn if lifting equipment are used!

**NOTICE****Use only properly functioning lifting equipment!**

Use only properly functioning lifting equipment to lift and lower the pump. Ensure that the pump does not become jammed during lifting and lowering. Do **not** exceed the maximum bearing capacity of the lifting equipment! Check that lifting equipment is functioning properly before use!

Only remove the outer packaging at the place of utilisation to ensure that the pump is not damaged during transport. Use tear-proof plastic sacks of sufficient size to package used pumps for transport in a leak-proof manner.

The following points must also be observed:

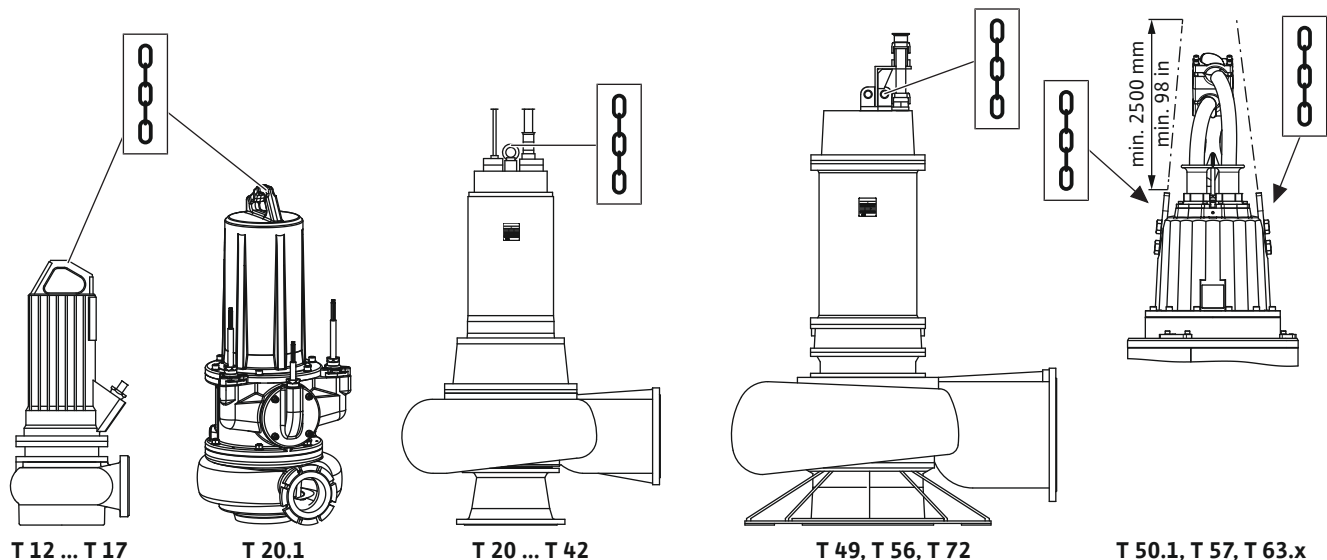


Fig. 2: Attachment points

- Adhere to the applicable national safety regulations.
- Use legally specified and approved lifting gear.
- Select the lifting gear based on the existing conditions (weather, attachment point, load, etc.).
- Only attach the lifting gear to the attachment point. Fix with a shackle.
- Use lifting equipment with sufficient bearing capacity.
- The stability of the lifting equipment must be ensured during operation.
- When using lifting equipment, a second person must be present to coordinate the procedure if required (e.g. if the operator's field of vision is blocked).

### 5.3 Storage



#### DANGER

##### Danger due to fluids hazardous to health!

If the pump is used in fluids hazardous to health, decontaminate the pump after dismantling and before carrying out any other work! There is a risk of fatal injury! Observe the specifications in the work regulations! The operator must make sure that the personnel have received and read the work regulations!



#### WARNING

##### Sharp edges on the impeller and suction port!

Sharp edges can form on the impeller and suction port. There is danger of limbs being severed! Protective gloves must be worn to protect from cuts.

#### CAUTION

##### Total damage due to moisture ingress

Moisture ingress in the power supply cable damages the power supply cable and the pump! Never immerse the end of the power supply cable in a fluid and firmly seal it during storage.

Newly supplied pumps can be stored for one year. Contact customer service to store the pump for more than one year.

The following must be observed for storage:

- Place the pump upright (vertical) on a firm bearing surface and **secure it against slipping and falling over!**
- The max. storage temperature is  $-15\text{ °C}$  to  $+60\text{ °C}$  ( $5\text{ °F}$  to  $140\text{ °F}$ ) at a max. relative humidity of 90 %, non-condensing. Frost-proof storage at a temperature of  $5\text{ °C}$  to  $25\text{ °C}$  ( $41\text{ °F}$  to  $77\text{ °F}$ ) with relative humidity of 40 % to 50 % is recommended.
- Do not store the pump in rooms in which welding work is carried out. The resulting gases or radiation can corrode the elastomer parts and coatings.



- Seal the suction and pressure connection tightly.
- Protect power supply cables against kinking and damage.
- Protect the pump from direct sunlight and heat. Extreme heat can cause damage to the impellers and the coating!
- Impellers must be turned by 180 ° at regular intervals (3 – 6 months). This prevents locking of the bearings and renews the lubrication film of the mechanical seal. **WARNING! There is a risk of injury due to sharp edges on the impeller and suction port!**
- Elastomer parts and the coating are subject to natural brittleness. Contact customer service if the pump must be stored for more than 6 months.

After storage, remove any dust and oil from the pump and check the coating for damage. Repair damaged coatings before further use.

## 6 Installation and electrical connection

### 6.1 Personnel qualifications

- Electrical work: A qualified electrician must carry out the electrical work.
- Installation/dismantling: The technician must be trained in the use of the necessary tools and fixation materials for the relevant construction site.

### 6.2 Installation types

- Vertical stationary wet well installation
- Vertical portable wet well installation
- Vertical stationary dry well installation

The installation types are dependent on the motor type:

Motor type	Stationary wet	Portable wet	Stationary dry
T 12 ... T 17	•	•	•
T 20.1	•	•	•
T 20 ... T 24	•	o	o
T 30 ... T 34	•	–	o
T 42 ... T 72	•	–	–

Key: – = not possible, o = possible on order by order basis, • = possible

The following installation types are **not** permitted:

- Horizontal installation
- ### 6.3 Operator responsibilities
- Observe locally applicable accident prevention and safety regulations of trade associations.
  - Observe all regulations for working with heavy loads and under suspended loads.
  - Provide protective equipment and ensure that the protective equipment is worn by personnel.
  - Observe local sewage technology regulations for the operation of sewage systems.
  - Avoid pressure surges!  
Pressure surges can occur in long pressure pipes with steep terrain. These pressure surges can lead to the destruction of the pump!
  - Ensure the cooling time of the motor depending on the operating conditions and the size of the pump chamber.
  - Structural components and foundations must be of sufficient stability in order to allow the device to be fixed securely and functionally. The operator is responsible for the provision and suitability of the structural component/foundation!
  - Check that the available consulting documents (installation plans, design of the operating space, inflow conditions) are complete and correct.

### 6.4 Installation



#### DANGER

#### Risk of fatal injury due to dangerous lone working practices!

Work in chambers and narrow rooms as well as work involving risk of falling are dangerous work. Such work may not be carried out autonomously! A second person must be present for safety reasons.

**WARNING****Hand and foot injuries due to lack of protective equipment!**

Danger of (serious) injuries during work. Wear the following protective equipment:

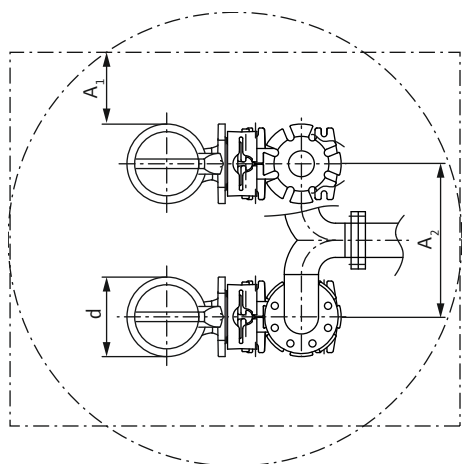
- Safety gloves for protection against cuts
- Safety shoes
- Safety helmet must be worn if lifting equipment are used!

**NOTICE****Use only properly functioning lifting equipment!**

Use only properly functioning lifting equipment to lift and lower the pump. Ensure that the pump does not become jammed during lifting and lowering. Do **not** exceed the maximum bearing capacity of the lifting equipment! Check that lifting equipment is functioning properly before use!

- Prepare operating space/installation location as follows:
  - Clean, free of coarse solids
  - Dry well
  - Frost-free
  - Decontaminated
- Take immediate countermeasures if there is a build-up of toxic or suffocating gases!
- Attach the lifting gear to the attachment point using a shackle. Only use lifting gear which has been technically approved.
- Use lifting gear for lifting, lowering and transporting the pump. Never pull the pump by the power supply cable!
- It must be possible to attach lifting equipment safely. The storage place and the operating space/installation site must be accessible with the lifting equipment. The set-down location must have a solid bearing surface.
- The routed power supply cables must allow safe operation. Check whether the cable cross-section and the cable length are sufficient for the selected installation type.
- The corresponding IP class must be observed when using switchgear. Install the switchgear overflow-proof and outside potentially explosive areas!
- Avoid air intake into the fluid, use baffles or deflector plates for the inlet. Air which has entered the system can collect in the pipe system and lead to impermissible operating conditions. Air pockets must be removed via ventilation systems!
- A dry run of the pump is prohibited! Avoid air pockets in the hydraulics housing or in the pipe system. Ensure the water level never falls below the minimum. The installation of a dry-running protection is recommended!

#### 6.4.1 Indications for double pump operation



If several pumps are used in an operating space, minimum distances between the pumps and the wall must be complied with. Here there is a difference in the distances depending on the type of system: Alternating operation or parallel operation.

d	Diameter hydraulics housing
A <sub>1</sub>	Minimum distance from the wall: – alternating operation: min. 0.3 × d – parallel operation: min. 1 × d
A <sub>2</sub>	Distance to pressure pipes – alternating operation: min. 1.5 × d – parallel operation: min. 2 × d

Fig. 3: Minimum distances

### 6.4.2 Unloading pumps delivered in horizontal position

To prevent excessive tension and bending forces being applied to the pump, the pumps can, depending on their size and weight, be laid out horizontally for delivery. Delivery is on specially designed transport frames. Please observe the following work steps when unloading the pump.



#### NOTICE

##### Use only properly functioning lifting equipment!

Use only properly functioning lifting equipment to lift and lower the pump. Ensure that the pump does not become jammed during lifting and lowering. Do **not** exceed the maximum bearing capacity of the lifting equipment! Check that lifting equipment is functioning properly before use!

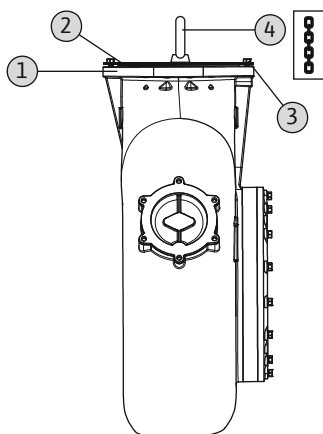


Fig. 4: Attachment point installation

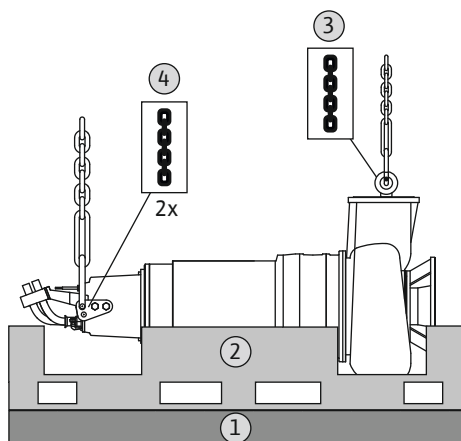


Fig. 5: Unload pump: prepare

**Install the supplied attachment point (provided by the customer) on the pressure port.**

1	Pressure connection
2	Load bar
3	Fixation load bar/pressure connection
4	Attachment point for angular loading up to 90 °

- ✓ Load bar with the corresponding bearing capacity for fixation of the attachment point
  - ✓ Attachment point for angular loading up to 90 ° (e.g. "Theipa" type)
  - ✓ Fixation material for the load bar
1. Place the load bar onto the pressure connection and attach it using two holes that are **opposite** each other.
  2. Fix the attachment point to the load bar.
- Attachment point installed, pump prepared for attaching.

#### Preparatory tasks

1	Bearing surface
2	Transport frame
3	Attachment point hydraulics
4	Attachment point motor

- ✓ The transport frame lies horizontally on a firm bearing surface.
  - ✓ 2x lifting equipment with sufficient bearing capacity are provided.
  - ✓ A sufficient number of approved items of lifting gear are provided.
1. Attach 1st lifting equipment to the hydraulics attachment point.
  2. Attach 2nd lifting equipment to the motor attachment points.
- Pump ready for lifting and aligning.

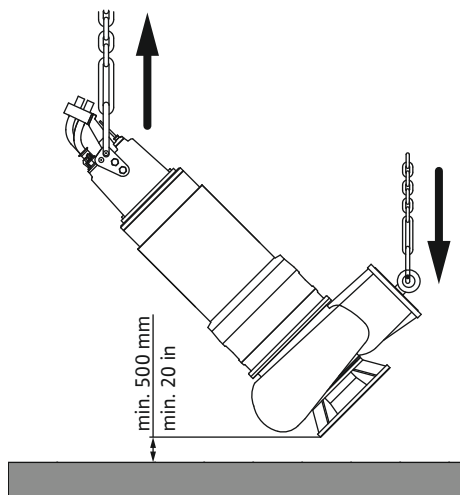


Fig. 6: Unload pump: turn

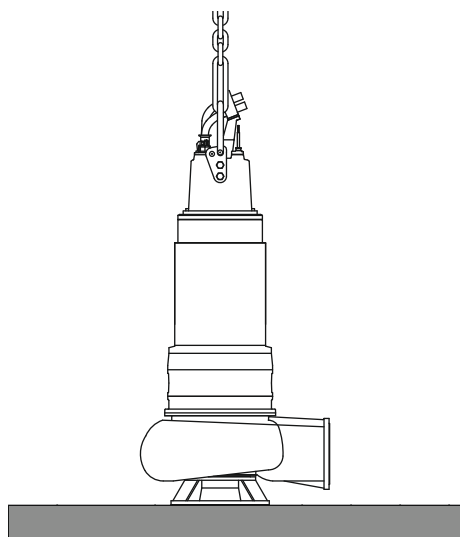


Fig. 7: Unload pump: set down

### 6.4.3 Maintenance tasks

#### 6.4.3.1 Rotate impeller

#### WARNING

#### Sharp edges on the impeller and suction port!

Sharp edges can form on the impeller and suction port. There is danger of limbs being severed! Protective gloves must be worn to protect from cuts.



#### Small pumps (T 12 ... T 20.1)

- ✓ The pump is **not** connected to the mains!
  - ✓ Protective equipment must be put on!
1. Place the pump on a firm surface in a horizontal position. **WARNING! Risk of hands being crushed. Make sure that the pump cannot fall over or slip!**
  2. Reach into the hydraulics housing carefully from below and slowly and turn the impeller.

#### Lift and align the pump

- ✓ Preparatory tasks completed.
  - ✓ Weather conditions permit unloading.
1. Slowly lift the pump using both items of lifting equipment. **CAUTION! Make sure that the pump remains horizontal!**
  2. Remove transport frame.
  3. Use the two items of lifting equipment to slowly move the pump into the vertical position. **CAUTION! Make sure that the housing parts do not touch the ground. The high point loads damage the housing parts.**
  4. Once the pump is set upright, loosen the lifting gear at the hydraulics.
    - ▶ The pump is aligned and ready to be set down.

#### Set down pump

- ✓ The pump is aligned vertically (plumb).
  - ✓ Lifting gear removed at the hydraulics.
1. Lower the pump slowly and set it down carefully. **CAUTION! If the pump is set down too quickly, the hydraulics housing on the suction port can be damaged. Set the pump down slowly on the suction port! NOTICE! If the pump cannot be placed level on the suction port, use appropriate adjustment plates.**
    - ▶ The pump is ready for installation.

**WARNING! If the pump is placed in temporary storage and the lifting equipment dismantled, secure the pump against falling over and slipping!**

After a storage period of more than 6 months, carry out the following maintenance tasks before installation:

- Rotate the impeller.
- Check the oil in the sealing chamber.

**Large pumps (T 24 ... T 63.2)**

- ✓ The pump is **not** connected to the mains!
  - ✓ Protective equipment must be put on!
1. Place the pump upright on a firm surface. **WARNING! Risk of hands being crushed. Make sure that the pump cannot fall over or slip!**
  2. Carefully and slowly reach into the hydraulics housing through the pressure port and rotate the impeller.

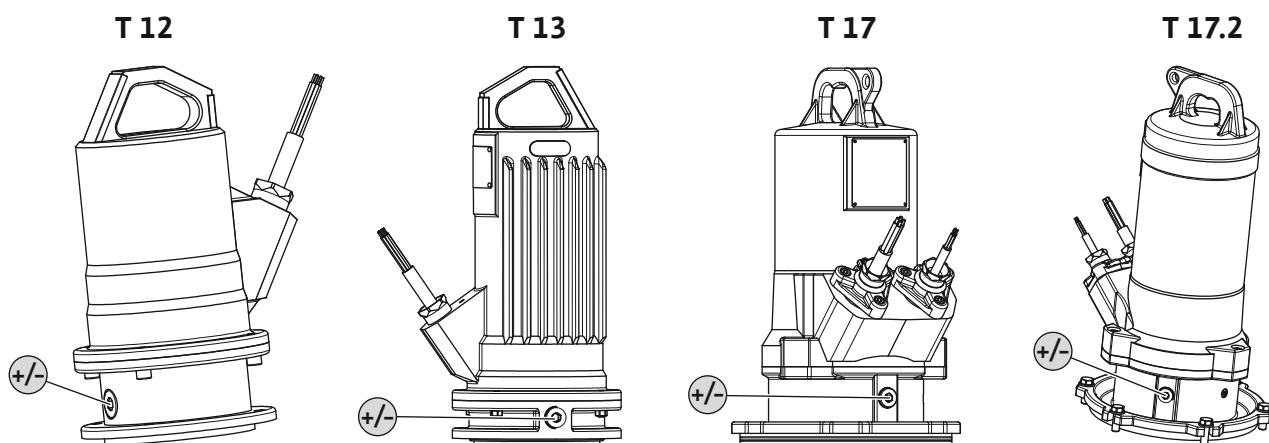
**6.4.3.2 Check oil in the sealing chamber****Motor T 12, T 13, T 17, T 17.2**

Fig. 8: Sealing chamber: Check oil

+/- Fill/drain the oil in the sealing chamber

- ✓ Pump is **not** installed.
  - ✓ Pump is **not** connected to the mains.
  - ✓ Protective equipment has been put on!
1. Place the pump horizontally on a firm surface. The screw plug points upwards. **WARNING! Risk of hands being crushed. Ensure that the pump cannot fall over or slip away!**
  2. Unscrew the screw plug.
  3. Place a suitable tank to collect the operating fluid.
  4. Drain the operating fluid: Rotate the pump until the opening points downwards.
  5. Check the operating fluid:
    - ⇒ If the operating fluid is clear, reuse operating fluid.
    - ⇒ If the operating fluid is contaminated (black), fill with new operating fluid. Dispose of operating fluid in accordance with the local regulations!
    - ⇒ Notify customer service if an operating fluid contains metal chips!
  6. Pour in operating fluid: Rotate the pump until the opening points upwards. Fill-in the operating fluid into the opening.
    - ⇒ Comply with the specifications for operating fluid locations and quantity! When recycling the operating fluid, check the quantity and if required adjust it!
  7. Clean the screw plug, replace the seal ring and screw it back in. **Max. tightening torque: 8 Nm (5.9 ft lb)!**

## Motors T 20, T 20.1, T 24

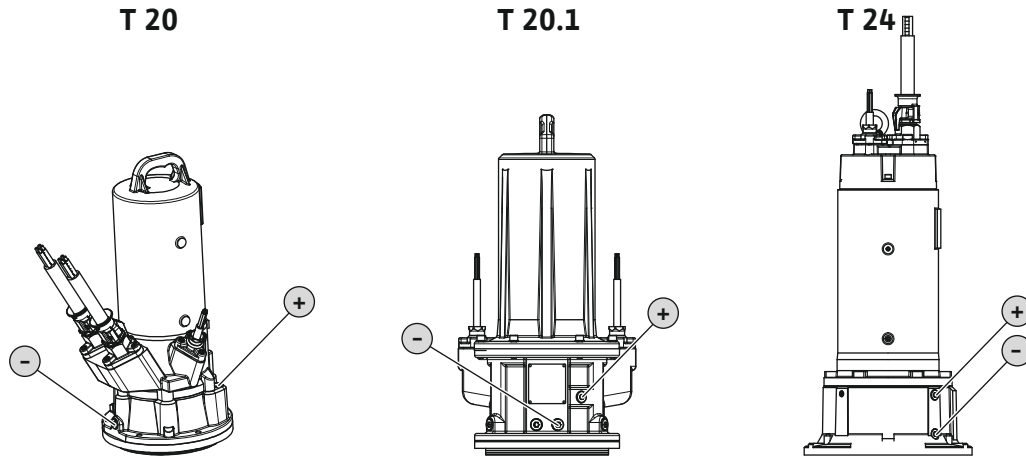


Fig. 9: Sealing chamber: Check oil

+	Add the oil to the sealing chamber
-	Drain the oil in the sealing chamber

- ✓ Pump is **not** installed.
  - ✓ Pump is **not** connected to the mains.
  - ✓ Protective equipment has been put on!
1. Place the pump upright on a firm surface. **WARNING! Risk of hands being crushed. Ensure that the pump cannot fall over or slip away!**
  2. Place a suitable tank to collect the operating fluid.
  3. Unscrew the screw plug (+).
  4. Unscrew screw plug (-) and drain the operating fluid. If a shut-off ball cock is installed on the outlet opening, open the shut-off ball cock.
  5. Check the operating fluid:
    - ⇒ If the operating fluid is clear, reuse operating fluid.
    - ⇒ If the operating fluid is contaminated (black), fill with new operating fluid. Dispose of operating fluid in accordance with the local regulations!
    - ⇒ Notify customer service if the operating fluid contains swarf!
  6. If a shut-off ball cock is installed on the outlet opening, close the shut-off ball cock.
  7. Clean the screw plug (-), replace the seal ring and screw it back in. **Max. tightening torque: 8 Nm (5.9 ft-lb)!**
  8. Pour the new operating fluid in through the hole for the screw plug (+).
    - ⇒ Comply with the specifications for operating fluid type and quantity! When recycling the operating fluid, check the quantity and if required adjust it!
  9. Clean the screw plug (+), replace the seal ring and screw it back in. **Max. tightening torque: 8 Nm (5.9 ft-lb)!**

## Motors T 30, T 34, T 42, T 49, T 50.1, T 56, T 57, T 63.x, T 72

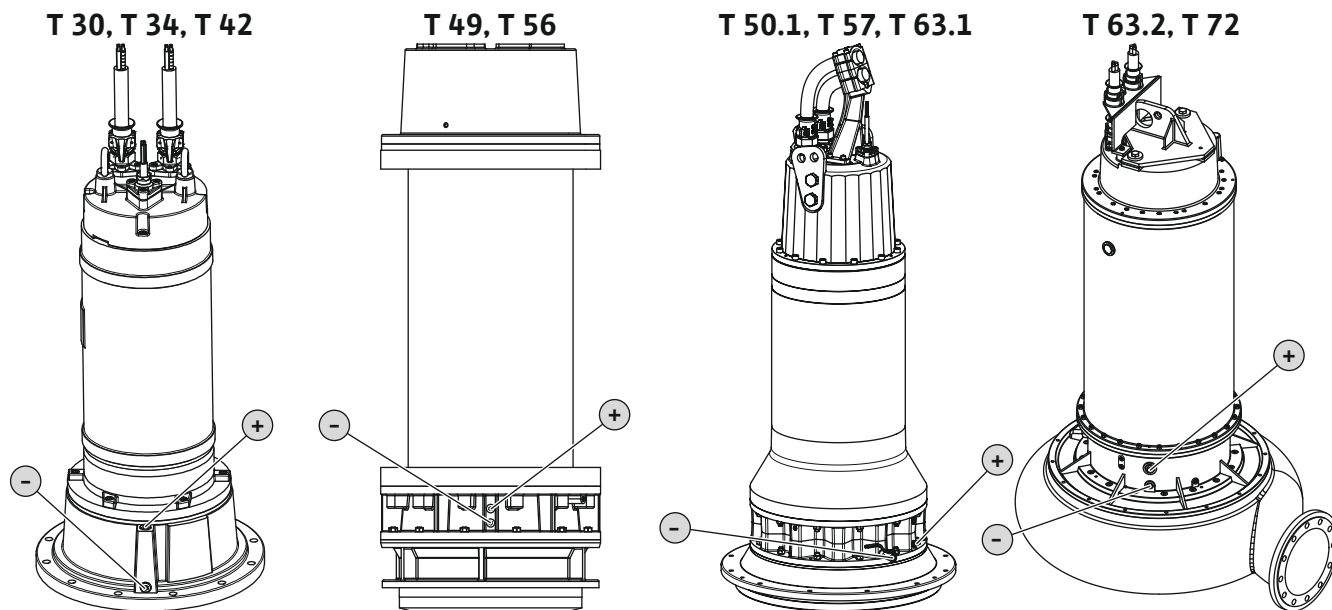


Fig. 10: Sealing chamber: Check oil

+	Add the oil to the sealing chamber
-	Drain the oil in the sealing chamber

- ✓ Pump is **not** installed.
  - ✓ Pump is **not** connected to the mains.
  - ✓ Protective equipment has been put on!
1. Place the pump upright on a firm surface. **WARNING! Risk of hands being crushed. Ensure that the pump cannot fall over or slip away!**
  2. Place a suitable tank to collect the operating fluid.
  3. Unscrew the screw plug (+).
  4. Unscrew screw plug (-) and drain the operating fluid. If a shut-off ball cock is installed on the outlet opening, open the shut-off ball cock.
  5. Check the operating fluid:
    - ⇒ If the operating fluid is clear, reuse operating fluid.
    - ⇒ If the operating fluid is contaminated (black), fill with new operating fluid. Dispose of operating fluid in accordance with the local regulations!
    - ⇒ Notify customer service if the operating fluid contains swarf!
  6. If a shut-off ball cock is installed on the outlet opening, close the shut-off ball cock.
  7. Clean the screw plug (-), replace the seal ring and screw it back in. **Max. tightening torque: 8 Nm (5.9 ft·lb)!**
  8. Pour the new operating fluid in through the hole for the screw plug (+).
    - ⇒ Comply with the specifications for operating fluid type and quantity! When recycling the operating fluid, check the quantity and if required adjust it!
  9. Clean the screw plug (+), replace the seal ring and screw it back in. **Max. tightening torque: 8 Nm (5.9 ft·lb)!**

## 6.4.4 Stationary wet well installation

**NOTICE****Pumping problems due to water level being too low**

If the fluid is lowered too much, separation of the volume flow may occur. Furthermore, air cushions may form in the hydraulic system, resulting in undesirable behaviour during operation. The minimum permissible water level must reach the upper edge of the hydraulics housing!

The pump is installed in the fluid for the wet well installation. For this, a suspension unit must be installed in the chamber. On the pressure side, the on-site pipe system is connected to the suspension unit and on the suction side to the pump. The connected pipe system must be self-supporting. The suspension unit must **not** support the pipe system!

#### Work steps

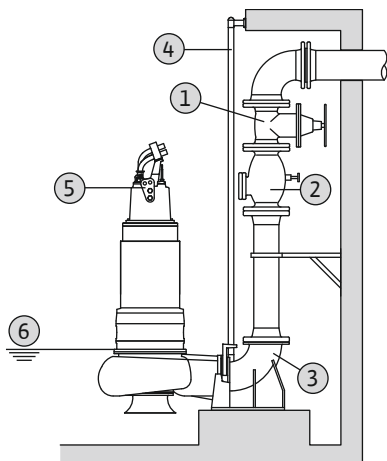


Fig. 11: Wet well installation, stationary

1	Gate valve
2	Non-return valve
3	Suspension unit
4	Guide pipes (provided by the customer)
5	Attachment point for the lifting equipment
6	Minimum water level

- ✓ Operating space/installation location is prepared for the installation.
  - ✓ Suspension unit and pipe system were installed.
  - ✓ Pump is prepared for operation on the suspension unit.
1. Use a shackle to attach the lifting equipment to the attachment point of the pump.
  2. Lift the pump, swivel it above the chamber opening and slowly lower the guide claw onto the guide pipe.
  3. Lower the pump until it sets on the suspension unit and is connected automatically. **CAUTION! Hold the power supply cables slightly taut when lowering the pump!**
  4. Loosen the lifting equipment from the lifting gear and secure it at the chamber outlet against falling.
  5. Have the power supply cables routed into the chamber by a qualified electrician and route it outside properly from the chamber.
- The pump is installed, the qualified electrician can make the electrical connection.

#### 6.4.5 Portable wet well installation



#### WARNING

##### Risk of burns from hot surfaces!

Motor housing can become hot during operation. It may cause burns. Allow the pump to cool down at ambient temperature after switching it off!



#### WARNING

##### Separation of pressure hose!

Separation or movement of the pressure hose can lead to (serious) injuries. Securely attach the pressure hose to the outlet! Prevent buckling of the pressure hose.



#### NOTICE

##### Pumping problems due to water level being too low

If the fluid is lowered too much, separation of the volume flow may occur. Furthermore, air cushions may form in the hydraulic system, resulting in undesirable behaviour during operation. The minimum permissible water level must reach the upper edge of the hydraulics housing!

For portable installation, the pump must be equipped with a pump support foot. The pump support foot ensures minimum ground clearance in the suction area and enables secure footing if placed on a solid bearing surface. In this installation type, the pump can be installed anywhere in the operating space/installation site. A hard base must be used at the installation location to prevent sinking in case of soft bearing surfaces. A pressure hose is connected on the pressure side. If operated for longer periods of time, fix the pump firmly to the floor. This prevents vibration and ensures quiet and low-wearing running.



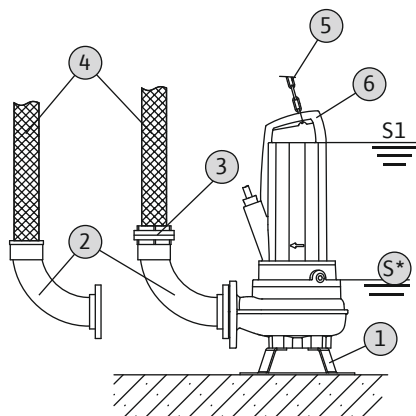


Fig. 12: Wet well installation, portable

### Work steps

1	Pump support foot
2	Pipe elbow with hose connection or Storz pipe coupling
3	Storz hose coupling
4	Pressure hose
5	Lifting equipment
6	Attachment point
S*	Non-immersed operating mode: Observe information on the rating plate!

- ✓ Pump support foot mounted.
- ✓ Pressure connection prepared: Pipe elbow with hose connection or pipe elbow with Storz coupling mounted.
  1. Use a shackle to attach the lifting equipment to the attachment point of the pump.
  2. Lift the pump and lower it at the intended location (chamber, pit).
  3. Place the pump on a solid bearing surface. **CAUTION! Sinking must be prevented!**
  4. Lay the pressure hose and fasten it to a certain point (e.g. drainage).  
**DANGER! Separation or movement of the pressure hose can lead to (serious) injuries! Securely attach the pressure hose to the outlet.**
  5. Lay the power supply cable properly. **CAUTION! Do not damage the power supply cable!**
- ▶ The pump is installed, the qualified electrician can make the electrical connection.

#### 6.4.6 Stationary dry well installation



#### NOTICE

##### Pumping problems due to water level being too low

If the fluid is lowered too much, separation of the volume flow may occur. Furthermore, air cushions may form in the hydraulic system, resulting in undesirable behaviour during operation. The minimum permissible water level must reach the upper edge of the hydraulics housing!

In dry well installation, the operating space is divided into the collecting space and the machine room. In the collecting space, the fluid flows and is collected; the pump technology is installed in the machine room. The pump is installed in the machine room and connected to the pipe system on the suction and pressure side. Observe the following points for installation:

- The suction- and pressure-side pipe system must be self-supporting. The pump must not support the pipe system.
- Connect the pump to the pipe system ensuring that it is free of stress and vibrations. The use of elastic connection pieces (compensators) is recommended.
- The pump is not self-priming, in other words, the fluid must flow in either automatically or with supply pressure. The minimum level in the collecting space must be at the same height as the upper edge of the hydraulics housing!
- Max. ambient temperature: 40 °C (104 °F)

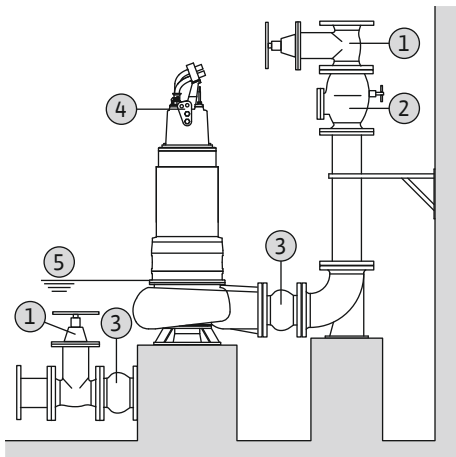


Fig. 13: Dry well installation

### Work steps

1	Gate valve
2	Non-return valve
3	Compensator
4	Attachment point for the lifting equipment
5	Minimum water level in collecting space

- ✓ Machine room/installation location is prepared for the installation.
- ✓ Pipe system has been properly installed and is self-supporting.
  1. Use a shackle to attach the lifting equipment to the attachment point of the pump.
  2. Lift the pump and position it in the machine room. **CAUTION! Hold the power supply cables slightly taut when positioning the pump!**
  3. Fasten pump to the foundation properly.
  4. Connect pump to the pipe system. **NOTICE! Ensure the connection is free of stress and vibrations. If required, use plastic connection pieces (compensators).**
  5. Loosen the lifting gear from the pump.
  6. Have the power supply cables installed in the machine room by a qualified electrician.
- ▶ The pump is installed, the qualified electrician can make the electrical connection.

### 6.4.7 Level control



#### DANGER

#### Risk of explosion due to incorrect installation!

If the level control is installed within a potentially explosive area, the signal transmitter must be connected via an Ex cut-off relay or a Zener barrier. There is a risk of explosion if connected incorrectly! Connection must be carried out by a qualified electrician.

With a level control device, the current fill levels are determined and the pump is switched on and off automatically depending on the fill levels. Fill levels are recorded by using different sensor types (float switches, pressure and ultrasound measurements or electrodes). The following must be observed when using a level control device:

- Float switches can move freely!
- The water level must **not fall below** the minimum permissible!
- The maximum switching frequency **must not be exceeded!**
- If the fill levels fluctuate strongly, a level control with two measuring points is recommended. This makes it possible to achieve larger differential gaps.

### 6.4.8 Dry-running protection

Dry-running protection must prevent the pump from operating without fluid and air from entering the hydraulics. The minimum permissible fill level must be determined with the help of a signal transmitter. Once the specified limit value is reached, the pump must be deactivated with an appropriate signal. Dry-running protection can expand the available level controls by an additional measuring point or function as an independent switch-off device. Depending on the system security, the pump can be restarted automatically or manually. Installation of dry-running protection is recommended for optimum operational reliability.

### 6.5 Electrical connection



#### DANGER

#### Risk of death due to electrocution!

Improper conduct when carrying out electrical work can lead to death due to electric shock! Electrical work must be carried out by a qualified electrician in accordance with the locally applicable regulations.

**DANGER****Risk of explosion due to incorrect connection!**

- Always connect the pump to an electrical outlet outside the explosive area. If the connection must be made within the explosive area, then connection must be carried out in an Ex-rated housing (ignition protection class DIN EN 60079-0)! Non-observance may lead to fatal injury due to explosion!
- Connect the potential compensator to the earth terminal indicated. The earth terminal is installed in the area of the power supply cable. A cable cross-section in accordance with the locally applicable regulations must be used for the potential compensator.
- Connection must always be carried out by a qualified electrician.
- For the electrical connection, also note the additional information in the chapter on potentially explosive areas found in the appendix of these installation and operating instructions!

- The mains connection must match the specifications on the rating plate.
- Power supply on mains side for three-phase current motors with clockwise rotating field.
- Lay the connection cable in accordance with the locally applicable regulations and connect it according to the wire assignment.
- Connect the monitoring devices and check their function.
- Earth the device properly in accordance with applicable local regulations.

**6.5.1 Fuse on mains side*****Circuit breaker***

The size and switching characteristics of the circuit breakers must conform to the rated current of the connected product. Observe local regulations.

***Motor protection switch***

Make provision for an on-site motor protection switch for devices without a plug! The minimum requirement is a thermal relay/motor protection switch with temperature compensation, differential triggering and anti-reactivation device in accordance with the local regulations. In case of sensitive mains, make provision for the installation on-site of other protective equipment (e.g. overvoltage, undervoltage or phase failure relay, etc.).

***Residual-current device (RCD)***

Comply with the regulations of the local energy supply company! The use of a residual-current device is recommended.

If persons come into contact with the device and conductive fluids, secure the connection **with** a residual-current device (RCD).

**6.5.2 Maintenance tasks**

Carry out the following maintenance tasks prior to installation:

- Check the insulation resistance of the motor winding.
- Test the resistance of the temperature sensor.
- Test the resistance of the pencil electrode (optionally available).

If the measured values differ from the specifications:

- Moisture may have penetrated into the motor or the connection cable.
- The monitoring device may be defective.

Contact customer service in the event of a fault.

**6.5.2.1 Checking the insulation resistance of the motor winding**

Use an insulation tester to measure the insulation resistance (measuring voltage = 1000 V). Observe the following values:

- At the time of initial commissioning: Insulation resistance may not be less than 20 MΩ.
- For further measurements: Value must be greater than 2 MΩ.

**6.5.2.2 Test the resistor of the temperature sensor**

Measure the resistor of the temperature sensors with an ohmmeter. The following measured values must be complied with:

- **Bimetallic strip:** Measured value = 0 ohms (continuity).
- **PTC sensor** (PTC thermistor): Measured value depends on the number of sensors installed. A PTC sensor has a cold resistance range of 20 to 100 ohms.
  - With **three** sensors in series, the measured value range is from 60 to 300 ohms.

- With **four** sensors in series, the measured value range is from 80 to 400 ohms.
- **Pt100 sensor:** Pt100 sensors have a resistance value of 100 ohms at 0 °C (32 °F). Between 0 °C (32 °F) and 100 °C (212 °F), the resistance increases by 0.385 ohms per 1 °C (1.8 °F) increase.  
At an ambient temperature of 20 °C (68 °F), the resistance is 107.7 ohms.

**6.5.2.3 Testing the resistor of the external electrode for sealing chamber control**

Measure the resistor of the electrode with an ohmmeter. The measured value must approach “infinity”. For values ≤ 30 kOhm, if there is water in the oil – change the oil!

**6.5.3 Three-phase motor connection**

The three-phase current version is supplied with bare cable ends. Connection to the mains is established by connecting the power supply cables in the switchgear. Refer to the attached connection diagram for more precise details regarding the connection.  
**Electrical connection must always be carried out by a qualified electrician!**

**NOTICE! The individual wires are designated according to the connection diagram. Do not cut the wires! There is no additional assignment between the wiring diagram and connection diagram.**

Wiring diagram of the power connections for direct activation	
U, V, W	Mains connection
PE (green-yellow)	Earth

Wiring diagram of the power connections for star-delta starting	
U1, V1, W2	Mains connection (start of winding)
U2, V2, W2	Mains connection (end of winding)
PE (green-yellow)	Earth

**6.5.4 Monitoring equipment connection**

Refer to the enclosed connection diagram for details regarding the connection and installation of the monitoring devices. **Electrical connection must always be carried out by a qualified electrician!**

**NOTICE! The individual wires are designated according to the connection diagram. Do not cut the wires! There is no additional assignment between the wiring diagram and connection diagram.**



**DANGER**  
**Risk of explosion due to incorrect connection!**  
 If the monitoring devices are not connected correctly, there is a risk of fatal injury due to explosion in potentially explosive areas! Connection must always be carried out by a qualified electrician. If used in potentially explosive areas:

- Connect the thermal motor monitoring via an evaluation relay!
- Deactivation by the temperature limiter must be conducted with reactivation lock! It must only be possible to restart the unit when the unlock key has been actuated by hand!
- Connect the external electrode (e.g. sealing chamber control) via an evaluation relay with an intrinsically safe circuit!
- Note the additional information in the chapter on potentially explosive areas found in the appendix of these installation and operating instructions!

**Overview of monitoring devices**

	T 12 ... T 17	T 20	T 20.1	T 24 ... T 42	T 49, T 56	T 50, T 50.1, T 57.1, T 63.1	T 63.2, T 72	

Internal monitoring devices

	T 12 ... T 17	T 20	T 20.1	T 24 ... T 42	T 49, T 56	T 50, T 50.1, T 57.1, T 63.1	T 63.2, T 72
Motor compartment	•	•	–	–	–	–	–
Terminal room/motor compartment	–	–	•	•	•	•	•
Motor winding	•	•	•	•	•	•	•
Motor bearings	–	o	o	o	o	o	o
Sealing chamber	•	–	–	–	–	•	•
Leakage chamber	–	–	•	–	–	•	•
Vibration sensor	–	–	–	o	o	o	o
External monitoring devices							
Sealing chamber	o	o	o	o	o	o	o

• = standard-equipped , – = not available, o = optional

**All the monitoring devices fitted must always be connected!**

**6.5.4.1 Monitoring of motor compartment**

Connect the electrodes via an evaluation relay. Relay “NIV 101/A” is recommended for this. The threshold is 30 kOhm.

**Wiring diagram**

DK Electrode connection

**The system must be deactivated when the threshold is reached!**

**6.5.4.2 Monitoring of terminal room/motor compartment**

Connect the electrodes via an evaluation relay. Relay “NIV 101/A” is recommended for this. The threshold is 30 kOhm.

**Wiring diagram**

DK Electrode connection

**The system must be deactivated when the threshold is reached!**

**6.5.4.3 Terminal room, motor compartment and sealing chamber monitoring**

Connect the electrodes via an evaluation relay. Relay “NIV 101/A” is recommended for this. The threshold is 30 kOhm.

**Wiring diagram**

DK Electrode connection

**The system must be deactivated when the threshold is reached!**

**6.5.4.4 Monitoring of motor winding**

**With bimetallic strips**

Directly connect bimetallic strips to the switchgear or via an evaluation relay. Connection values: max. 250 V (AC), 2.5 A, cos φ = 1

**Wiring diagram for bimetallic strip**

Temperature limiter

20, 21 Bimetallic strip connection

Temperature controller and limiter

21 High temperature connection

20 Centre terminal

22 Low temperature connection

**With PTC sensor**

Connect the PTC sensor via an evaluation relay. Relay “CM-MSS” is recommended for this. The threshold has been preset.

**PTC sensor wiring diagram**

Temperature limiter

10, 11 PTC sensor connection

Temperature controller and limiter

11 High temperature connection

10 Centre terminal

12 Low temperature connection

**Triggering status for temperature controller and limiter**

Depending on the version of the thermal motor monitoring, the following triggering status must occur when the threshold value is reached:

- Temperature limiter (1 temperature circuit):  
The system must be deactivated when the threshold is reached.
- Temperature controller and limiter (2 temperature circuits):  
When the threshold for the low temperature is reached, the motor can deactivate with automatic reactivation. When the threshold for the high temperature limit is reached, the motor must deactivate with manual reactivation.

**Note the additional information in the section on potentially explosive areas in the appendix!**

**6.5.4.5 Leakage chamber monitoring**

The float switch is equipped with a potential-free normally closed contact. The switching capacity can be found in the supplied connection diagram.

**Wiring diagram**

K20, K21 Float switch connection

**When the float switch is activated, a warning must be issued or deactivation must take place.**

**6.5.4.6 Monitoring of motor bearing**

Connect the Pt100 sensor via an evaluation relay. Relay "DGW 2.01G" is recommended for this. The threshold is 100 °C (212 °F).

**Wiring diagram**

T1, T2 Pt100 sensor connection

**When the threshold is reached, deactivation must take place!**

**6.5.4.7 Monitoring of vibration occurring due to operation**

Connect the vibration sensor via a suitable evaluation relay. For more precise details on connection of the vibration sensor, see the installation and operating instructions of the evaluation relay.

**The limit values must be set during commissioning and recorded in the commissioning log. When the threshold is reached, deactivation must take place!**

**6.5.4.8 Sealing chamber monitoring (external electrode)**

Connect the external electrode via an evaluation relay. Relay "NIV 101/A" is recommended for this. The threshold is 30 kOhm.

**Once the threshold is reached, a warning must be output or the unit must be switched off.**

**CAUTION****Connection of the sealing chamber control**

If on reaching the threshold, there is only a warning, the pump could be irreparably damaged by the water ingress. Deactivation of the pump is always recommended!

**Note the additional information in the chapter on potentially explosive areas found in the appendix!**

**6.5.5 Motor protection adjustment**

Motor protection must be set depending on the selected activation type.

- 6.5.5.1 Direct activation**
- At full load, set the motor protection switch to the rated current (see rating plate). At partial load, it is recommended to set the motor protection switch 5 % above the current measured at the duty point.
- 6.5.5.2 Star-delta activation**
- The motor protection setting depends on the installation:
- Motor protection installed in the motor line: Set the motor protection to 0.58 x the rated current.
  - Motor protection installed in the mains supply cable: Set the motor protection to the rated current.
- The maximum start-up time in star connection is 3 seconds.
- 6.5.5.3 Soft starter**
- At full load, set the motor protection switch to the rated current (see rating plate). At partial load, it is recommended to set the motor protection switch 5 % above the current measured at the duty point. The following points must also be observed:
- Power consumption must always be below the rated current.
  - Complete starting and stopping within 30 s.
  - To avoid power dissipation, bypass the electronic starter (soft start) once normal operation is reached.
- 6.5.6 Operation with frequency converter**
- Operation on the frequency converter is permitted. Refer to the appendix for the relevant requirements!

## 7 Commissioning



### WARNING

#### Foot injuries due to a lack of protective equipment!

Danger of (serious) injuries during work. Wear safety shoes!

- 7.1 Personnel qualifications**
- Electrical work: A qualified electrician must carry out the electrical work.
  - Operation/control: Operating personnel must be instructed in the functioning of the complete system.
- 7.2 Operator responsibilities**
- Providing installation and operating instructions by the pump or at a place specially reserved for it.
  - Making the installation and operating instructions available in the language of the personnel.
  - Making sure that the installation and operating instructions are read and understood by all personnel.
  - All safety devices and emergency cut-outs on the system-side must be active and checked to ensure that they work properly.
  - The pump is suitable for use under the specified operating conditions.
- 7.3 Direction of rotation check (for three-phase current motors only)**
- The pump is factory-checked and adjusted to the correct direction of rotation for a clockwise rotating field. Connection is made in accordance with the specifications in chapter "Electrical connection".
- Direction of rotation check***
- A qualified electrician checks the rotating field at the mains connection with a rotating field-test device. For the correct direction of rotation, a clockwise rotating field must be available at the mains connection. The pump is **not** approved for operation with a counter-clockwise rotating field! **CAUTION! If the direction of rotation is checked with a test run, comply with the ambient and operating conditions!**
- Incorrect direction of rotation***
- If the direction of rotation is incorrect, change the connection as follows:
- Swap two phases for motors with direct starting.
  - Swap the connections of two windings (e.g. U1/V1 and U2/V2) for star-delta activation motors.

## 7.4 Operation in an explosive atmosphere



### DANGER

#### Risk of explosion due to flying sparks in the hydraulics!

During operation the hydraulics must be flooded (completely filled with the fluid). If the volume flow is interrupted or the hydraulics emerges, air cushions can form in the hydraulics. If this happens, there is a risk of explosion, e.g. flying sparks due to static charge! Dry-running protection must ensure that the pump is deactivated at the appropriate level.

### Overview of standard motors

	T 12	T 13	T 17	T 17.2	T 20	T 20.1	T 24	T 30	T 34	T 42	T 49	T 50	T 50.1	T 56	T 63.1/T 63.2	T 72
ATEX approval	o	o	o	o	o	o	o	o	o	o	-	-	o	o	o	-
FM approval	o	o	o	o	o	o	o	o	o	o	o	-	o	o	o	-
CSA-Ex approval	o	o	o	o	o	-	o	o	o	-	-	-	-	-	-	-

#### Key

- = not available/possible, o = optional, • = as standard

### Overview of IE3 motors (derived from IEC 60034)

	T 17 ...-E3	T 17.2 ...-E3	T 20.1 ...-E3	T 24 ...-E3	T 30 ...-E3	T 34 ...-E3	T 42 ...-E3	T 50.1 ...-E3	T 57.1 ...-E3	T 63.1 ...-E3	T 63.2 ...-E3
ATEX approval	o	o	o	o	o	o	o	o	o	o	o
FM approval	-	-	-	-	-	-	-	-	-	-	-
CSA-Ex approval	-	-	-	-	-	-	-	-	-	-	-

#### Key

- = not available/possible, o = optional, • = as standard

For use in explosive atmospheres, the pump must be marked as follows on the rating plate:

- "Ex" symbol of the corresponding approval
- Ex classification

**For the relevant requirements, refer to the explosion protection chapter in the appendix of these installation and operating instructions!**

#### ATEX approval

The pumps are suitable for operation in potentially explosive atmospheres:

- Device group: II
- Category: 2, zone 1 and zone 2

**These pumps must not be used in zone 0!**

#### FM approval

The pumps are suitable for operation in potentially explosive atmospheres:

- Protection class: Explosionproof
- Category: Class I, Division 1

Notice: If the cabling is carried out according to Division 1, installation in Class I, Division 2 is also permitted.



**CSA-Ex-rating according to division (Motor T 12, T 13, T 17, T 17.2, T 20, T 34)**

The pumps are suitable for operation in potentially explosive atmospheres:

- Protection class: Explosion-proof
- Category: Class 1 Division 1

**CSA-Ex-rating according to zone (Motor T 24, T 30)**

The pumps are suitable for operation in potentially explosive atmospheres:

- Device group: II
- Category: 2, zone 1 and zone 2

**These pumps must not be used in zone 0!**

**7.5 Before switching on**

Check the following prior to activation:

- Check whether the device has been installed properly and in accordance with the locally applicable regulations:
  - Has the pump been earthed?
  - Layout of power supply cable tested?
  - Electrical connection made properly?
  - Mechanical components attached correctly?
- Check level control:
  - Float switches can move freely?
  - Switching level tested (pump on, pump off, minimum water level)?
  - Additional dry-running protection installed?
- Test operating conditions:
  - Min./max. temperature of the fluid tested?
  - Max. immersion depth tested?
  - Operating mode defined depending on the minimum water level?
  - Maximum switching frequency adhered to?
- Check installation location/operating space:
  - Pipe system on the pressure side free of deposits?
  - Inlet or pump sump cleaned or free of deposits?
  - All gate valves open?
  - Minimum water level defined and monitored?

The hydraulics housing must be filled completely with the fluid and there must be no air cushions in the hydraulics. **NOTICE! Provide suitable venting devices if there is a risk of air cushions being formed in the system!**

**7.6 Switching on and off**

During the start process, the rated current is temporarily exceeded. During operation, the rated current may no longer be exceeded. **CAUTION! If the pump does not start, switch off the pump immediately. Remove the fault before reactivating the pump!**

Place pumps which are installed as portable pumps on a firm surface so they are level. If pumps have fallen over, place them upright again before activating them. Securely attach the pump with screws in case of difficult surfaces.

**Pumps with free cable end**

The pump must be switched on and off using a separate operating point (on/off switch, switchgear) provided by the customer.

**Pump with attached plug**

- Three-phase current version: After inserting the plug into the socket, the pump is ready for operation. The pump is switched on and off with the ON/OFF switch.

**Pump with attached float switch and plug**

- Three-phase current version: After inserting the plug into the socket, the pump is ready for operation. The pump is controlled via two switches on the plug:
  - MANUAL/AUTO: Determines if the pump is switched on and off directly (MANUAL) or depending on the fill level (AUTO).
  - ON/OFF: Switch pump on and off.

## 7.7 During operation

**DANGER****Risk of explosion due to overpressure in the hydraulics!**

If the gate valves on the suction and pressure sides are closed during operation, the fluid in the hydraulics housing is heated up by the pumping movement. This heating creates a pressure of several bars in the hydraulics. The pressure can result in the pump exploding! Make sure that all gate valves are open during operation. Open closed gate valves immediately!

**WARNING****Amputation of limbs due to rotating components!**

No persons must be present in the work area of the pump! There is risk of (serious) injuries due to rotating components! No persons must be present in the work area of the pump during start-up or operation.

**WARNING****Risk of burns from hot surfaces!**

Motor housing can become hot during operation. It may cause burns. Allow the pump to cool down at ambient temperature after switching it off!

**NOTICE****Pumping problems due to water level being too low**

If the fluid is lowered too much, separation of the volume flow may occur. Furthermore, air cushions may form in the hydraulic system, resulting in undesirable behaviour during operation. The minimum permissible water level must reach the upper edge of the hydraulics housing!

When operating the pump, observe the locally applicable regulations on the following topics:

- Workplace safety
- Accident prevention
- Handling electrical machines

Strictly comply with the personnel responsibilities specified by the operator. All personnel are responsible for ensuring compliance with responsibilities and regulations!

Due to their design, centrifugal pumps have rotating parts that are easily accessible. Depending on operating conditions, sharp edges can develop on these parts. **WARNING! This can lead to cuts and limbs may be severed!** Check the following points at regular intervals:

**Motors T 12, T 13, T 17, T 17.2, T 20, T 20.1, T 24, T 30, T 34, T 42**

- Operating voltage (+/-10 % of the rated voltage)
- Frequency (+/-2 % of the rated frequency)
- Power consumption between individual phases (max. 5 %)
- Voltage difference between the individual phases (max. 1 %)
- Max. switching frequency
- Minimum water submersion depending on the operating mode
- Inlet: no air intake
- Level control device/dry-running protection: Switching points
- Quiet/low-vibration running
- All gate valves open

**Motors T 49, T 50.1, T 56, T 57, T 63.x, T 72**

- Operating voltage (+/- 5 % of the rated voltage)
- Frequency (+/- 2 % of the rated frequency)
- Current consumption between individual phases (max. 5 %)
- Voltage difference between the individual phases (max. 1 %)
- Max. switching frequency
- Minimum water submersion depending on the operating mode

- Inlet: no air intake.
- Level control device/dry-running protection: Switching points
- Quiet/low-vibration running
- All gate valves open

#### **Operation in the limit range**

The pump can briefly be operated in the limit range (max. 15 min/day). During operation in the limit range, expect relatively large deviations from the operating data. **NOTICE! Continuous duty in the limit range is prohibited! The pump is exposed to high wear and there is a greater risk of failure!**

The following parameters apply during operation in the limit range:

- Operating voltage (+/-10 % of the rated voltage)
- Frequency (+3/-5 % of the rated frequency)
- Power consumption between individual phases (max. 6 %)
- Voltage difference between the individual phases (max. 2 %)

## **8 Shut-down/dismantling**

### **8.1 Personnel qualifications**

- Operation/control: Operating personnel must be instructed in the functioning of the complete system.
- Electrical work: A qualified electrician must carry out the electrical work.
- Installation/dismantling: The technician must be trained in the use of the necessary tools and fixation materials for the relevant construction site.

### **8.2 Operator responsibilities**

- Locally applicable accident prevention and safety regulations of trade associations.
- Observe regulations for working with heavy loads and under suspended loads.
- Provide the necessary protective equipment and make sure that the personnel wears it.
- Provide adequate aeration in closed rooms.
- Take immediate countermeasures if there is a build-up of toxic or suffocating gases!

### **8.3 Shut-down**

The pump is deactivated during decommissioning, but remains installed. This ensures that the pump is always ready for operation.

✓ To protect the pump from frost and ice, always immerse the pump completely in the fluid.

✓ The temperature of the fluid must always be above +3 °C (+37 °F).

1. Switch off the pump at the operating point.

2. Secure the operating point against being switched on again by unauthorised persons (e.g. lock main switch).

► The pump is out of operation and can now be dismantled.

If the pump remains installed after decommissioning, observe the following:

- Ensure that the prerequisites for decommissioning are maintained for the complete period of decommissioning. If these prerequisites cannot be guaranteed, dismantle the pump after decommissioning!
- For an extended period of decommissioning, carry out a 5-minute function test at regular intervals (monthly to quarterly). **CAUTION! A function test may only be carried out under the applicable operating conditions. A dry run is not permitted! Non-compliance can result in irreparable damage!**

### **8.4 Removal**



#### **DANGER**

#### **Danger due to fluids hazardous to health!**

If the pump is used in fluids hazardous to health, decontaminate the pump after dismantling and before carrying out any other work! There is a risk of fatal injury! Observe the specifications in the work regulations! The operator must make sure that the personnel have received and read the work regulations!

**DANGER****Risk of death due to electrocution!**

Improper conduct when carrying out electrical work can lead to death due to electric shock! Electrical work must be carried out by a qualified electrician in accordance with the locally applicable regulations.

**DANGER****Risk of fatal injury due to dangerous lone working practices!**

Work in chambers and narrow rooms as well as work involving risk of falling are dangerous work. Such work may not be carried out autonomously! A second person must be present for safety reasons.

**WARNING****Risk of burns from hot surfaces!**

Motor housing can become hot during operation. It may cause burns. Allow the pump to cool down at ambient temperature after switching it off!

**NOTICE****Use only properly functioning lifting equipment!**

Use only properly functioning lifting equipment to lift and lower the pump. Ensure that the pump does not become jammed during lifting and lowering. Do **not** exceed the maximum bearing capacity of the lifting equipment! Check that lifting equipment is functioning properly before use!

**8.4.1 Stationary wet well installation**

- ✓ Pump is decommissioned.
- ✓ Gate valves on the inlet and pressure side closed.
  1. Disconnect the pump from the mains.
  2. Attach the lifting equipment to the attachment point. **CAUTION! Never pull on the power supply cable! This damages the power supply cable!**
  3. Slowly raise the pump and lift above the guide pipes from the operating space. **CAUTION! The power supply cable can be damaged while lifting! Hold the power supply cable slightly taut when lifting!**
  4. Clean the pump thoroughly (see point "Cleaning and disinfecting"). **DANGER! Disinfect the pump when used in fluids hazardous to health!**

**8.4.2 Portable wet well installation**

- ✓ Pump is taken out of operation.
  1. Disconnect the pump from the mains.
  2. Roll up the power supply cable and place it over the motor housing. **CAUTION! Never pull on the power supply cable! This damages the power supply cable!**
  3. Loosen the pressure pipe from the pressure port.
  4. Attach the lifting equipment to the attachment point.
  5. Lift the pump from the operating space. **CAUTION! The power supply cable may be squeezed and damaged when setting the pump down! Pay attention to the power supply cable when setting the pump down!**
  6. Clean the pump thoroughly (see point "Cleaning and disinfecting"). **DANGER! Disinfect the pump when used in fluids hazardous to health!**

**8.4.3 Stationary dry well installation**

- ✓ Pump is taken out of operation.
- ✓ Gate valves on the inlet and pressure side closed.
  1. Disconnect the pump from the mains.

2. Roll up the power supply cable and attach to the motor. **CAUTION! Do not damage the power supply cable when attaching! Look out for crushing and cable breakage.**
3. Loosen the pipe system from the suction and discharge port. **DANGER! Fluids hazardous to health! Residues from the pumped fluid may still be present in the piping and hydraulics! Place collector tank, immediately wipe up drips and dispose of fluids properly.**
4. Attach the lifting equipment to the attachment point.
5. Loosen the pump from the foundation.
6. Lift the pump slowly out of the pipework and place on a suitable set-down location. **CAUTION! The power supply cable may be squeezed and damaged when setting the pump down! Pay attention to the power supply cable when setting the pump down!**
7. Clean pump thoroughly (see point "Cleaning and disinfecting"). **DANGER! Disinfect the pump when used in fluids hazardous to health!**

#### 8.4.4 Clean and disinfect



#### DANGER

#### Danger due to fluids hazardous to health!

Danger to life if the pump is used in fluids hazardous to health! Decontaminate the pump before carrying out any further work! Wear the following protective equipment while performing cleaning tasks:

- Closed safety goggles
- Breathing mask
- Protective gloves

⇒ The equipment listed here is the minimum requirement, observe the specifications of the work regulations! The operator must make sure that the personnel have received and read the work regulations!

- ✓ Pump is dismantled.
- ✓ Contaminated cleaning water is disposed of in the sewer in accordance with local regulations.
- ✓ A disinfectant is provided for contaminated pumps.
  1. Attach the lifting equipment to the attachment point of the pump.
  2. Lift the pump approximately 30 cm (10 in) above the ground.
  3. Spray the pump with clear water from top to bottom. **NOTICE! An appropriate disinfectant must be used for contaminated pumps! Strictly observe the manufacturer's specifications concerning use!**
  4. To clean the impeller and the pump interior, guide the water jet inside via the pressure port.
  5. Flush all dirt residue onto the floor of the channel.
  6. Allow the pump to dry out.

## 9 Maintenance and repair



#### DANGER

#### Danger due to fluids hazardous to health!

If the pump is used in fluids hazardous to health, decontaminate the pump after dismantling and before carrying out any other work! There is a risk of fatal injury! Observe the specifications in the work regulations! The operator must make sure that the personnel have received and read the work regulations!



**NOTICE**

**Use only properly functioning lifting equipment!**

Use only properly functioning lifting equipment to lift and lower the pump. Ensure that the pump does not become jammed during lifting and lowering. Do **not** exceed the maximum bearing capacity of the lifting equipment! Check that lifting equipment is functioning properly before use!

- Always carry out maintenance tasks in a clean location with good lighting. It must be possible to position the pump safely and secure it.
- Only carry out maintenance tasks mentioned in these installation and operating instructions.
- Wear the following protective equipment while performing maintenance tasks:
  - Safety goggles
  - Safety shoes
  - Safety gloves

**9.1 Personnel qualifications**

- Electrical work: A qualified electrician must carry out the electrical work.
- Maintenance tasks: The technician must be familiar with the use of operating fluids and their disposal. In addition, the technician must have basic knowledge of mechanical engineering.

**9.2 Operator responsibilities**

- Provide the necessary protective equipment and make sure that the personnel wears it.
- Collect operating fluids in suitable tanks and dispose of properly.
- Dispose of protective clothing used in accordance with regulations.
- Use only original parts of the manufacturer. Use of parts other than the original parts releases the manufacturer from any liability.
- Collect any leakage of fluid and operating fluid immediately and dispose of it according to the locally applicable guidelines.
- Provide the tools required.
- If flammable solvents and cleaning agents are used, open flames, naked lights and smoking are prohibited.

**9.3 Labelling of the screw plugs**

M	Motor compartment screw plugs
D	Sealing chamber screw plugs
K	Cooling system screw plugs
L	Leakage chamber screw plug
S	Condensation water chamber screw plug
F	Grease nipple screw plug

**9.4 Operating fluid**  
**9.4.1 Oil types**

Medicinal white oil is filled into the sealing chamber ex-factory. The following oil types are recommended when changing the oil:

- Aral Autin PL\*
- Shell ONDINA 919
- Esso MARCOL 52\* or 82\*
- BP WHITEMORE WOM 14\*
- Texaco Pharmaceutical 30\* or 40\*

All oil types marked with “\*” are approved for use with foods in accordance with “USDA-H1”.

**9.4.2 Grease**

Use the following greases:

- Esso Unirex N3
- Tripol Molub-Alloy-Food Proof 823 FM (with “**USDA-H1**” approval)

**9.4.3 Filling quantities**

Refer to the supplied configuration for the filling quantities.

**9.5 Maintenance intervals**

To ensure reliable operation, maintenance tasks must be carried out regularly. Depending on the real ambient temperatures, maintenance intervals different from those mentioned in the contract can be defined! If strong vibrations occur during operation, the pump and the installation must be checked regardless of the defined maintenance intervals.

### 9.5.1 Maintenance intervals for normal conditions

8000 operating hours or after 2 years at the latest

	Visual inspection of the connection cable	Visual inspection of accessories	Visual inspection of the coating and housing for wear	Function test of monitoring devices	Sealing chamber oil change*	Draining the leakage chamber	Grease lower roller bearings	Grease upper roller bearings	Drain condensation water
T 12	•	•	•	•	•	–	–	–	–
T 13	•	•	•	•	•	–	–	–	–
T 17	•	•	•	•	•	–	–	–	–
T 17.2	•	•	•	•	•	–	–	–	–
T 20	•	•	•	•	•	–	–	–	–
T 20.1	•	•	•	•	•	•	–	–	–
T 24	•	•	•	•	•	–	–	–	•
T 30	•	•	•	•	•	–	–	–	•
T 34	•	•	•	•	•	–	–	–	•
T 42	•	•	•	•	•	–	–	–	•
T 49	•	•	•	•	•	–	–	–	•
T 50.1	•	•	•	•	•	•	•	–	•
T 56	•	•	•	•	•	–	–	–	•
T 57	•	•	•	•	•	•	•	–	•
T 63.1	•	•	•	•	•	•	•	–	•
T 63.2	•	•	•	•	•	•	•	–	•
T 72	•	•	•	•	•	•	•	•	•

• = Carry out maintenance measures, – = do **not** carry out maintenance measures

**\*NOTICE! If a sealing chamber control is installed, the oil is changed according to the indicator!**

**15000 operating hours or after 10 years at the latest**

- General overhaul

### 9.5.2 Maintenance intervals for harsh conditions

Under harsh operating conditions, specified maintenance intervals must be shortened if required. Harsh operating conditions include:

- Fluids with long-fibre components
- Turbulent inlet (e.g. due to air intake, cavitation)
- Strongly corroding or abrasive fluids
- Heavily gas generating fluids
- Operation at an unfavourable duty point
- Pressure surges

When using pumps under hard conditions, it is recommended to sign a maintenance contract. Contact customer service.

## 9.6 Maintenance measures



### WARNING

#### Sharp edges on the impeller and suction port!

Sharp edges can form on the impeller and suction port. There is danger of limbs being severed! Protective gloves must be worn to protect from cuts.

**WARNING****Hand, foot or eye injuries due to the absence of protective equipment!**

Danger of (serious) injuries during work. Wear the following protective equipment:

- Safety gloves for protection against cuts
- Safety shoes
- Closed safety goggles

The following pre-requisites must be fulfilled prior to starting maintenance measures:

- Pump cooled down to the ambient temperature.
- Pump cleaned thoroughly and disinfected (if required).

### 9.6.1 Visual inspection of the connection cable

Check connection cable for:

- Bubbles
- Cracks
- Scratches
- Abrasion
- Pinch points

If damage is identified on the connection cable, decommission the pump immediately! Have the connection cable replaced by Wilo customer service. Only operate the pump up again once the damage has been properly remedied!

**CAUTION! Water may penetrate into the pump due to the damaged connection cable! Water ingress leads to total failure of the pump.**

### 9.6.2 Visual inspection of accessories

Accessories must be checked for:

- Correct fixation
- Smooth function
- Signs of wear, e.g. cracks caused by frequencies

Any defects detected must be repaired immediately or the accessories must be replaced.

### 9.6.3 Visual inspection of coatings and housing for wear

The coatings and housing parts must not show any signs of damage. If there are defects, the following must be observed:

- If the coating is damaged, it must be restored.
- Contact customer service if housing parts have worn out!

### 9.6.4 Function test of the monitoring device

The mixer must be cooled down to ambient temperature to test resistances!

#### 9.6.4.1 Test the resistor of the internal electrodes for motor compartment monitoring

Measure the resistor of the electrode with an ohmmeter. The measured value must approach "infinity". For values  $\leq 30$  kOhm, there is water in the motor compartment. **Contact customer service!**

#### 9.6.4.2 Test the resistor for the internal electrodes for terminal room/motor compartment monitoring

The internal electrodes are switched in parallel. During testing, all the electrodes are thus measured together.

Measure the resistor of the electrodes with an ohmmeter. The measured value must approach "infinity". At values  $\leq 30$  kOhm, there is water in the terminal room or motor compartment. **Contact customer service!**

#### 9.6.4.3 Test the resistor of the internal electrodes for monitoring the terminal room, motor compartment and sealing chamber

The internal electrodes are switched in parallel. During testing, all the electrodes are thus measured together.

Measure the resistor of the electrodes with an ohmmeter. The measured value must approach "infinity". At values  $\leq 30$  kOhm, there is water in the terminal room, motor compartment or sealing chamber. Change the oil in the sealing chamber and measure again.

**NOTICE! If the value is still  $\leq 30$  kOhm, contact customer service!**

#### 9.6.4.4 Test the resistor of the temperature sensor

Measure the resistor of the temperature sensors with an ohmmeter. The following measured values must be complied with:

- **Bimetallic strip:** Measured value = 0 ohms (continuity).



- **PTC sensor** (PTC thermistor): Measured value depends on the number of sensors installed. A PTC sensor has a cold resistance range of 20 to 100 ohms.
  - With **three** sensors in series, the measured value range is from 60 to 300 ohms.
  - With **four** sensors in series, the measured value range is from 80 to 400 ohms.
- **Pt100 sensor**: Pt100 sensors have a resistance value of 100 ohms at 0 °C (32 °F). Between 0 °C (32 °F) and 100 °C (212 °F), the resistance increases by 0.385 ohms per 1 °C (1.8 °F) increase. At an ambient temperature of 20 °C (68 °F), the resistance is 107.7 ohms.

#### 9.6.4.5 Testing the resistor of the external electrode for sealing chamber control

#### 9.6.5 Oil change in sealing chamber

Measure the resistor of the electrode with an ohmmeter. The measured value must approach "infinity". For values  $\leq 30 \text{ k}\Omega$ , if there is water in the oil – change the oil!



#### WARNING

#### Operating fluid under high pressure!

A pressure of **several bar can build up** in the motor! This pressure escapes when the screw plugs are **opened**. If screw plugs are opened without due caution, they can be ejected at high speed! To avoid injuries, observe the following instructions:

- Adhere to the prescribed sequence of work steps.
- Unscrew the screw plugs slowly, but never unscrew them completely. As soon as the pressure escapes (audible whistling or hissing of air), stop turning the screw plug any further!
- When the pressure has completely dissipated, fully unscrew the screw plugs.
- Wear closed safety goggles.



#### WARNING

#### Scalding from hot operating fluids!

Hot operating fluids can also spray out when pressure is released. This can result in scalding! To avoid injuries, the following instructions must be observed:

- Allow the motor to cool down to the ambient temperature before opening the screw plugs.
- Wear closed safety goggles or face protection and gloves.

#### Motor T 12, T 13, T 17, T 17.2

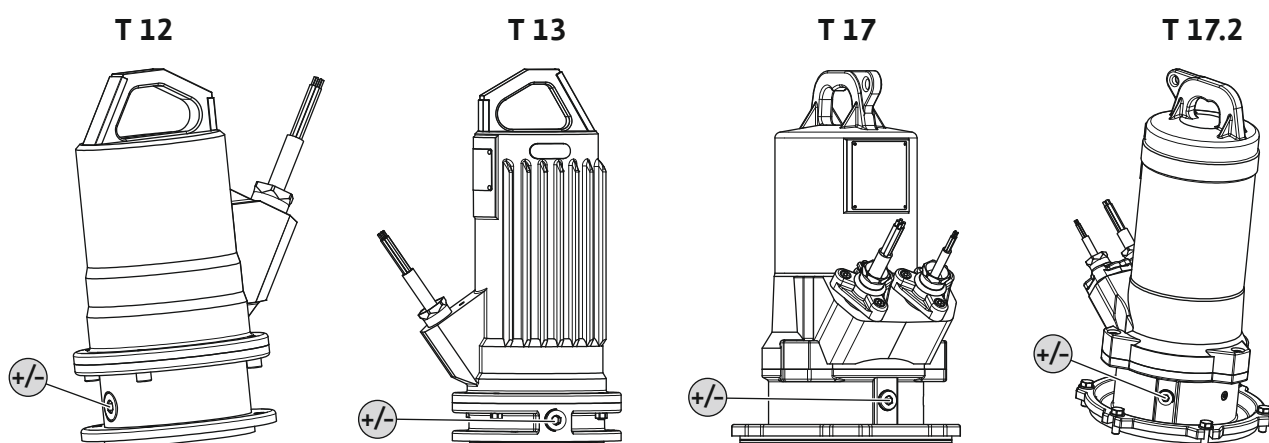


Fig. 14: Sealing chamber: Oil change

+/- Fill/drain the oil in the sealing chamber

- ✓ Protective equipment has been put on!
  - ✓ Pump has been dismantled and cleaned (decontaminated if required).
1. Position the pump horizontally on a firm surface. The screw plug points upwards.
 

**WARNING! Risk of hands being crushed. Ensure that the pump cannot fall over or slip away!**

2. Unscrew the screw plug slowly, but do not unscrew it completely. **WARNING! Overpressure in the motor! Stop turning the screw plug further if hissing or whistling is audible! Wait until the pressure has completely dissipated.**
3. After the pressure has dissipated, fully unscrew the screw plug.
4. Place a suitable tank to collect the operating fluid.
5. Drain the operating fluid: Rotate the pump until the opening points downwards.
6. Check the operating fluid: Notify customer service if an operating fluid contains metal chips!
7. Pour in operating fluid: Rotate the pump until the opening points upwards. Fill-in the operating fluid into the opening.
  - ⇒ Comply with the specifications for operating fluid locations and quantity!
8. Clean the screw plug, replace the seal ring and screw it back in. **Max. tightening torque: 8 Nm (5.9 ft-lb)!**

#### Motors T 20, T 20.1, T 24

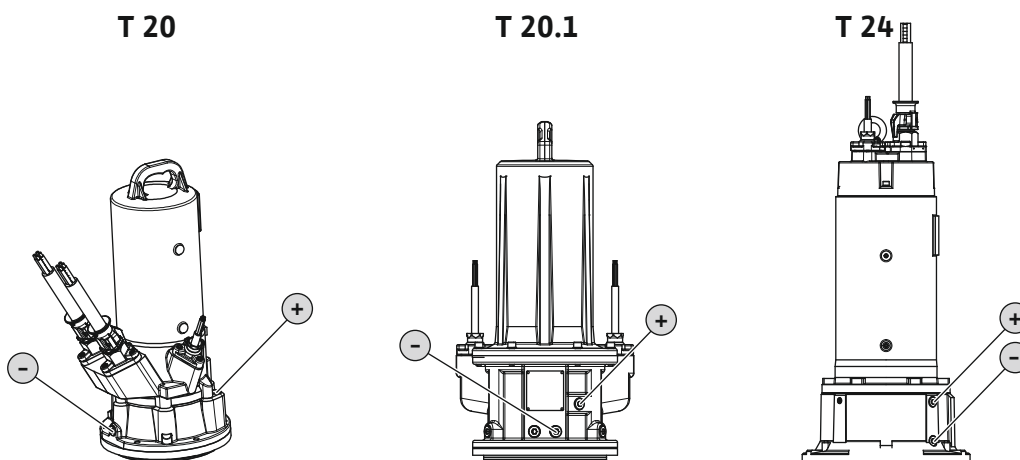


Fig. 15: Sealing chamber: Oil change

+	Add the oil to the sealing chamber
-	Drain the oil in the sealing chamber

- ✓ Protective equipment has been put on!
  - ✓ Pump has been dismantled and cleaned (decontaminated if required).
1. Place the pump upright on a firm surface. **WARNING! Risk of hands being crushed. Ensure that the pump cannot fall over or slip away!**
  2. Place a suitable tank to collect the operating fluid.
  3. Unscrew the screw plug (+) slowly, but do not unscrew it completely. **WARNING! Overpressure in the motor! Stop turning the screw plug further if hissing or whistling is audible! Wait until the pressure has completely dissipated.**
  4. After the pressure has dissipated, fully unscrew the screw plug (+).
  5. Unscrew screw plug (-) and drain the operating fluid. If a shut-off ball cock is installed on the outlet opening, open the shut-off ball cock.
  6. Check the operating fluid: Notify customer service if the operating fluid contains swarf!
  7. If a shut-off ball cock is installed on the outlet opening, close the shut-off ball cock.
  8. Clean the screw plug (-), replace the seal ring and screw it back in. **Max. tightening torque: 8 Nm (5.9 ft-lb)!**
  9. Pour the new operating fluid in through the hole of the screw plug (+).
    - ⇒ Comply with the specifications for operating fluid type and quantity!
  10. Clean the screw plug (+), replace the seal ring and screw it back in. **Max. tightening torque: 8 Nm (5.9 ft-lb)!**

## Motors T 30, T 34, T 42, T 49, T 50.1, T 56, T 57, T 63.x, T 72

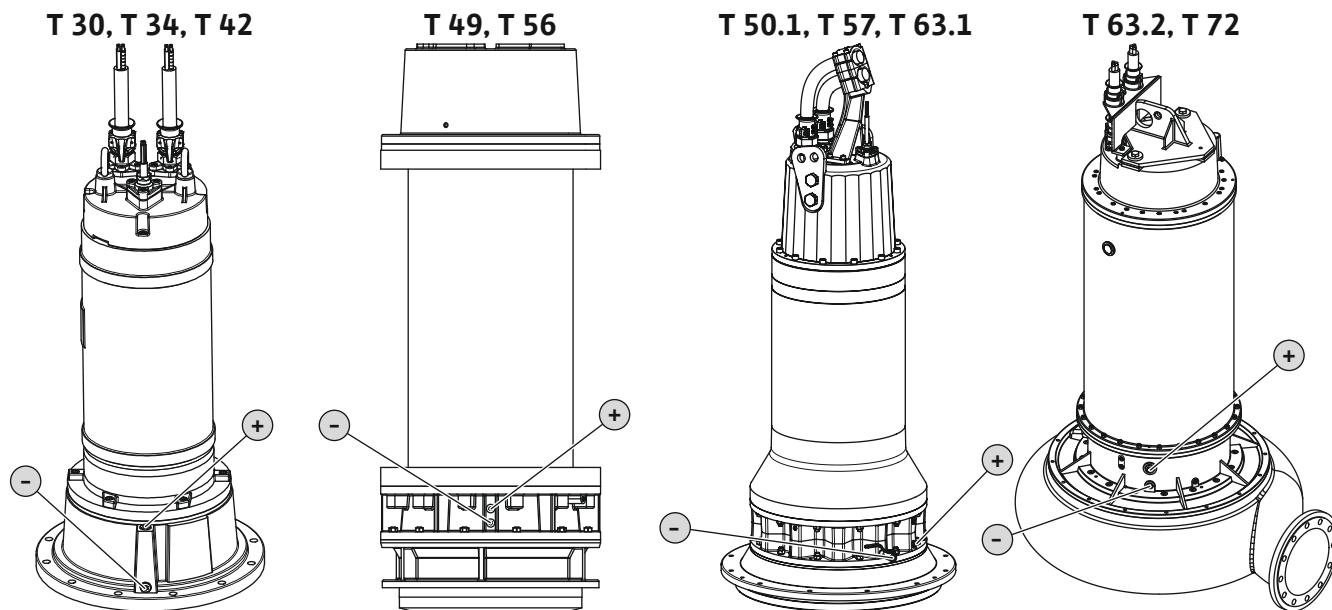


Fig. 16: Sealing chamber: Oil change

+	Add the oil to the sealing chamber
-	Drain the oil in the sealing chamber

- ✓ Protective equipment has been put on!
  - ✓ Pump has been dismantled and cleaned (decontaminated if required).
1. Place the pump upright on a firm surface. **WARNING! Risk of hands being crushed. Ensure that the pump cannot fall over or slip away!**
  2. Place a suitable tank to collect the operating fluid.
  3. Unscrew the screw plug (+) slowly, but do not unscrew it completely. **WARNING! Overpressure in the motor! Stop turning the screw plug further if hissing or whistling is audible! Wait until the pressure has completely dissipated.**
  4. After the pressure has dissipated, fully unscrew the screw plug (+).
  5. Unscrew screw plug (-) and drain the operating fluid. If a shut-off ball cock is installed on the outlet opening, open the shut-off ball cock.
  6. Check the operating fluid: Notify customer service if the operating fluid contains swarf!
  7. If a shut-off ball cock is installed on the outlet opening, close the shut-off ball cock.
  8. Clean the screw plug (-), replace the seal ring and screw it back in. **Max. tightening torque: 8 Nm (5.9 ft·lb)!**
  9. Pour the new operating fluid in through the hole of the screw plug (+).  
⇒ Comply with the specifications for operating fluid type and quantity!
  10. Clean the screw plug (+), replace the seal ring and screw it back in. **Max. tightening torque: 8 Nm (5.9 ft·lb)!**

## 9.6.6 Drain the leakage chamber

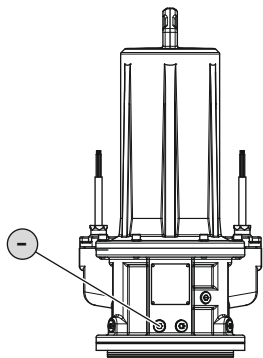


Fig. 17: Drain the leakage chamber: T 20.1

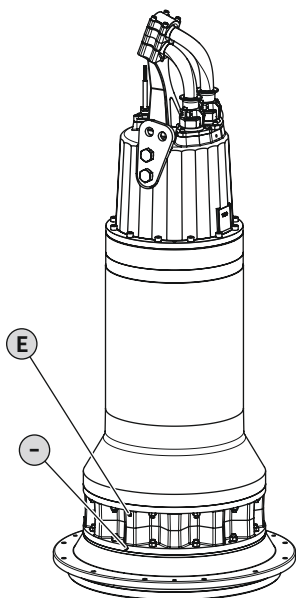


Fig. 18: Drain the leakage chamber: T 50.1, T 57, T 63.1

### Motors T 20.1

-	Drain off the leakage
---	-----------------------

- ✓ Protective equipment has been put on!
  - ✓ Pump has been dismantled and cleaned (decontaminated if required).
1. Place the pump upright on a firm surface. **WARNING! Risk of hands being crushed. Ensure that the pump cannot fall over or slip away!**
  2. Place a suitable tank to collect the operating fluid.
  3. Unscrew the screw plug slowly (-) but do not unscrew it completely. **WARNING! Overpressure in the motor! Stop turning the screw plug further if hissing or whistling is audible! Wait until the pressure has completely dissipated.**
  4. After the pressure has dissipated, fully unscrew the screw plug (-) and drain the operating fluid.
  5. Clean the screw plug (-), replace the seal ring and screw it back in. **Max. tightening torque: 8 Nm (5.9 ft·lb)!**

### Motors T 50.1, T 57, T 63.1

E	Venting
-	Drain off the leakage

- ✓ Protective equipment has been put on!
  - ✓ Pump has been dismantled and cleaned (decontaminated if required).
1. Place the pump upright on a firm surface. **WARNING! Risk of hands being crushed. Ensure that the pump cannot fall over or slip away!**
  2. Place a suitable tank to collect the operating fluid.
  3. Unscrew the screw plug (E) slowly, but do not unscrew it completely. **WARNING! Overpressure in the motor! Stop turning the screw plug further if hissing or whistling is audible! Wait until the pressure has completely dissipated.**
  4. After the pressure has dissipated, fully unscrew the screw plug (E).
  5. Unscrew screw plug (-) and drain the operating fluid.
  6. Clean screw plug (E) and (-), replace the seal ring and screw it back in. **Max. tightening torque: 8 Nm (5.9 ft·lb)!**

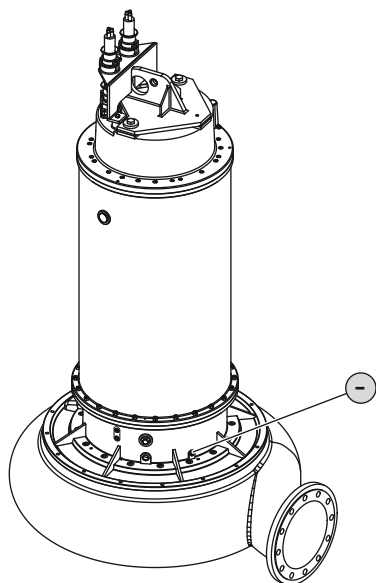


Fig. 19: Drain the leakage chamber: T 63.2, T 72

#### 9.6.7 Greasing roller bearings

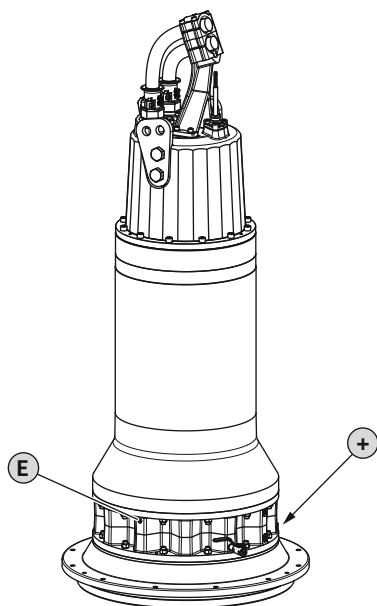


Fig. 20: Greasing roller bearings: T 50.1, T 57, T 63.1

#### Motor T 63.2, T 72

- Drain off the leakage

- ✓ Protective equipment has been put on!
  - ✓ Pump has been dismantled and cleaned (decontaminated if required).
1. Place the pump upright on a firm surface. **WARNING! Risk of hands being crushed. Ensure that the pump cannot fall over or slip away!**
  2. Place a suitable tank to collect the operating fluid.
  3. Unscrew the screw plug slowly (-) but do not unscrew it completely. **WARNING! Overpressure in the motor! Stop turning the screw plug further if hissing or whistling is audible! Wait until the pressure has completely dissipated.**
  4. After the pressure has dissipated, fully unscrew the screw plug (-) and drain the operating fluid.
  5. Clean the screw plug (-), replace the seal ring and screw it back in. **Max. tightening torque: 8 Nm (5.9 ft·lb)!**

#### Motors T 50.1, T 57, T 63.1

E Venting

+ Grease nipple for greasing (grease quantity: 200 g/7 oz)

- ✓ Protective equipment has been put on!
  - ✓ Pump has been dismantled and cleaned (decontaminated if required).
1. Place the pump upright on a firm surface. **WARNING! Risk of hands being crushed. Ensure that the pump cannot fall over or slip away!**
  2. Unscrew the screw plug (E) slowly, but do not unscrew it completely. **WARNING! Overpressure in the motor! Stop turning the screw plug further if hissing or whistling is audible! Wait until the pressure has completely dissipated.**
  3. After the pressure has dissipated, fully unscrew the screw plug (E).
  4. Unscrew the screw plug (+). The grease nipple for lubricating the bearings is located behind the screw plug.
  5. Use a grease gun to inject the new grease into the grease nipple.
  6. Clean screw plug (E) and (+), replace the seal ring and screw it back in. **Max. tightening torque: 8 Nm (5.9 ft·lb)!**

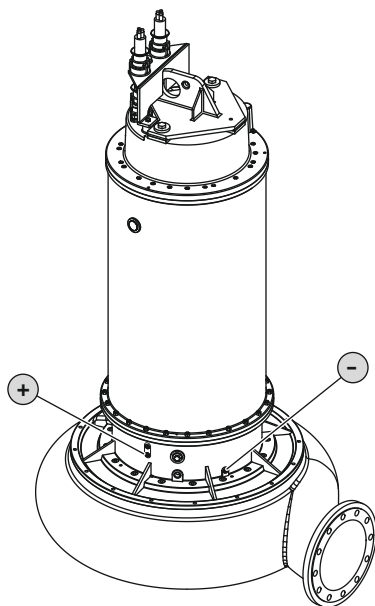


Fig. 21: Greasing roller bearings: T 63.2

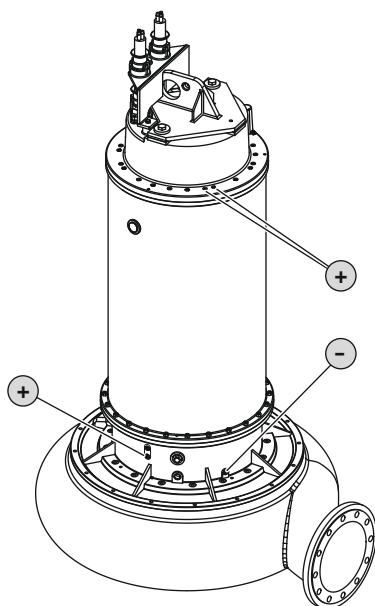


Fig. 22: Greasing roller bearings: T 72

### Motor T 63.2

-	Leakage chamber screw plug (venting)
+	Grease nipple for greasing (grease quantity: 200 g/7 oz)

- ✓ Protective equipment must be put on!
  - ✓ Pump has been dismantled and cleaned (decontaminated if required).
1. Place the pump on a firm surface in a vertical position. **WARNING! Risk of hands being crushed. Make sure that the pump can not fall over or slip!**
  2. Unscrew the leakage chamber screw plug (-) slowly and do not unscrew it completely. **WARNING! Overpressure in the motor! Stop turning the screw plug further if hissing or whistling is audible! Wait until the pressure has completely dissipated.**
  3. After the pressure has dissipated, fully unscrew the leakage chamber (-) screw plug.
  4. Unscrew the screw plug (+). The grease nipple for lubricating the bearings is located behind the screw plug.
  5. Use a grease gun to inject the new grease into the grease nipple.
  6. Clean screw plugs (-) and (+), fit with new seal ring and screw it back in. **Max. tightening torque: 8 Nm (5.9 ft-lb)!**

### Motor T 72

-	Leakage chamber screw plug (venting)
+	Grease nipple for greasing Grease quantity <b>lower</b> bearing: 160 g/6 oz Grease quantity <b>upper</b> bearing: 20 g/0.7 oz

- ✓ Protective equipment must be put on!
  - ✓ Pump has been dismantled and cleaned (decontaminated if required).
1. Place the pump on a firm surface in a vertical position. **WARNING! Risk of hands being crushed. Make sure that the pump can not fall over or slip!**
  2. Unscrew the leakage chamber screw plug (-) slowly and do not unscrew it completely. **WARNING! Overpressure in the motor! Stop turning the screw plug further if hissing or whistling is audible! Wait until the pressure has completely dissipated.**
  3. After the pressure has dissipated, fully unscrew the leakage chamber (-) screw plug.
  4. Unscrew the screw plug (+). The grease nipple for lubricating the bearings is located behind the screw plug.
  5. Use a grease gun to inject the new grease into the grease nipple.
  6. Clean screw plugs (-) and (+), fit with new seal ring and screw it back in. **Max. tightening torque: 8 Nm (5.9 ft-lb)!**

## 9.6.8 Draining condensation water

Motors T 24, T 30, T 34, T 42, T 49, T 56

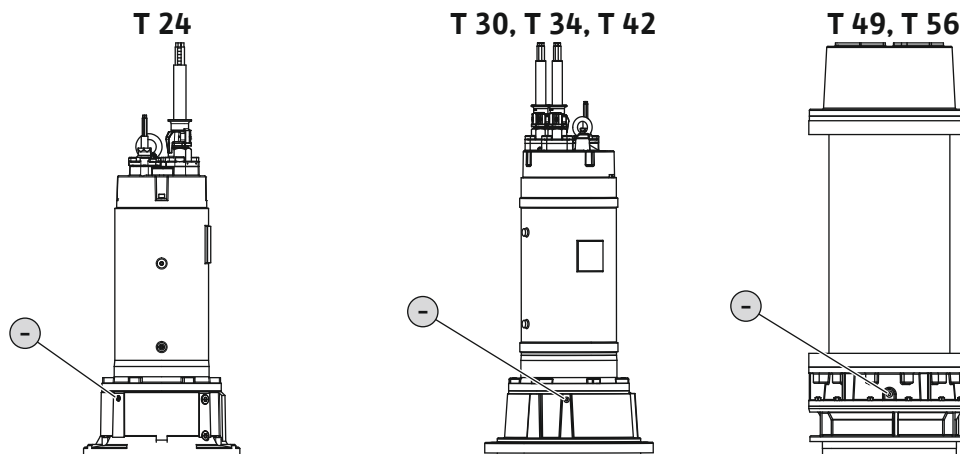


Fig. 23: Drain condensation water: T 24, T 30, T 34, T 42, T 49, T 56

- Draining condensation water

Motors T 50.1, T 57, T 63.1

- Draining condensation water

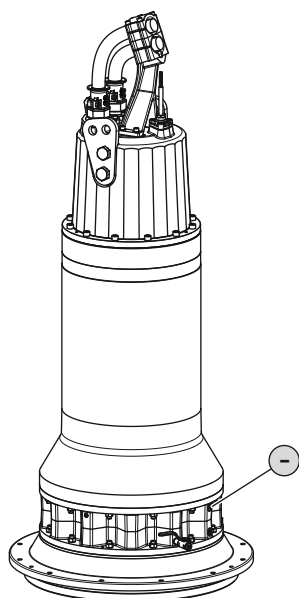


Fig. 24: Drain condensation water: T 50.1, T 57, T 63.1

✓ Protective equipment has been put on!

✓ Pump has been dismantled and cleaned (decontaminated if required).

1. Place the pump upright on a firm surface. **WARNING! Risk of hands being crushed. Ensure that the pump cannot fall over or slip away!**
2. Place a suitable tank to collect the operating fluid.
3. Unscrew the screw plug (-) but do not unscrew it completely. **WARNING! Overpressure in the motor! Stop turning the screw plug further if hissing or whistling is audible! Wait until the pressure has completely dissipated.**
4. After the pressure has dissipated, fully unscrew the screw plug (-) and drain the operating fluid.
5. Clean the screw plug (-), replace the seal ring and screw it back in. **Max. tightening torque: 8 Nm (5.9 ft·lb)!**

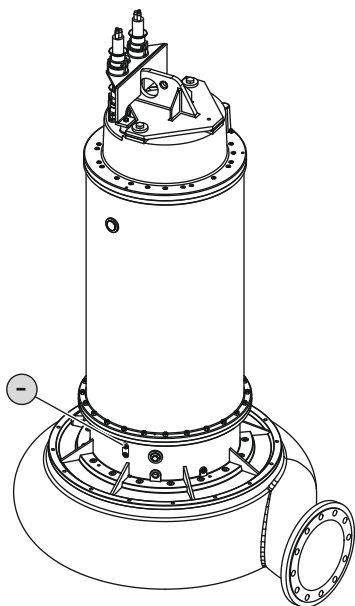


Fig. 25: Drain condensation water: T 63.2, T 72

## 9.7 Repairs

### Motor T 63.2, T 72

#### - Drain condensation water

- ✓ Protective equipment has been put on!
  - ✓ Pump has been dismantled and cleaned (decontaminated if required).
1. Place the pump upright on a firm surface. **WARNING! Risk of hands being crushed. Ensure that the pump cannot fall over or slip away!**
  2. Place a suitable tank to collect the operating fluid.
  3. Unscrew the screw plug slowly (-) but do not unscrew it completely. **WARNING! Overpressure in the motor! Stop turning the screw plug further if hissing or whistling is audible! Wait until the pressure has completely dissipated.**
  4. After the pressure has dissipated, fully unscrew the screw plug (-) and drain the operating fluid.
  5. Clean the screw plug (-), replace the seal ring and screw it back in. **Max. tightening torque: 8 Nm (5.9 ft-lb)!**



#### WARNING

##### Sharp edges on the impeller and suction port!

Sharp edges can form on the impeller and suction port. There is danger of limbs being severed! Protective gloves must be worn to protect from cuts.



#### WARNING

##### Hand, foot or eye injuries due to the absence of protective equipment!

Danger of (serious) injuries during work. Wear the following protective equipment:

- Safety gloves for protection against cuts
- Safety shoes
- Closed safety goggles

The following preconditions must be met prior to starting repair work:

- Pump cooled down to the ambient temperature.
- Pump is switched voltage-free and secured against being activated inadvertently.
- Pump cleaned thoroughly and disinfected (if required).

For repair work the following generally applies:

- Wipe up spillage quantities of fluid and operating fluid immediately!
- Always replace O-rings, gaskets and screw locking devices!
- Observe the tightening torques in the appendix!
- Never use force when carrying out this work!

### 9.7.1 Instructions on using screw locking devices

A screw locking device can be used on the screws. Screw locking is done at the factory using two different methods:

- Thread-locking fluid
- Mechanical screw locking device

#### Always re-apply the screw locking device!

##### Thread-locking fluid

Medium-strength thread-locking fluid (e.g. Loctite 243) is used for the liquid screw locking compound. This threadlocker can be loosened with increased force. If the thread-locking fluid cannot be loosened, then the compound must be heated to approx. 300 °C (572 °F). Clean the components thoroughly after dismantling.



### Mechanical screw locking device

The mechanical screw locking device consists of two Nord-Lock wedge lock washers. The screw connection is secured by the clamping force. The Nord-Lock screw locking device must only be used on bolts with strength class 10.9 which have been coated with Geomet. **The use of stainless screws is prohibited!**

#### 9.7.2 Which repair work may be carried out

- Changing the hydraulics housing.
- SOLID G- and Q impeller: Readjusting the suction port.

#### 9.7.3 Changing the hydraulics housing



#### DANGER

#### Dismantling the impeller is prohibited!

Depending on the impeller diameter, the impeller must be removed for dismantling the hydraulics housing on some pumps. Before carrying out any work, check whether dismantling the impeller is necessary. If yes, notify customer service! The dismantling of the impeller must be carried out by customer service or an authorized specialist workshop.

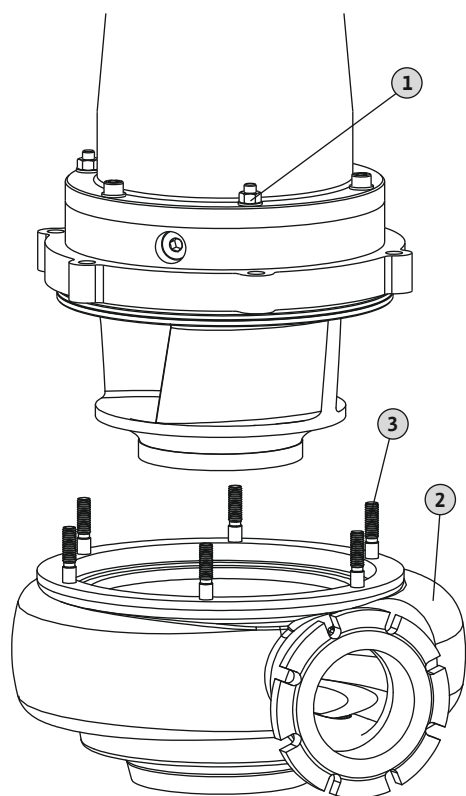


Fig. 26: Changing the hydraulics housing

1	Hexagon nuts for fixation of the motor/hydraulics
---	---

2	Hydraulics housing
---	--------------------

3	Threaded bolt
---	---------------

✓ Lifting equipment with sufficient bearing capacity is present.

✓ Protective equipment has been put on.

✓ New hydraulics housing is ready.

✓ Impeller **must not** be dismantled!

1. Attach lifting equipment with suitable lifting gear to the attachment point of the pump.

2. Place the pump upright.

**CAUTION! If the pump is placed down too quickly, the hydraulics housing at the suction port can be damaged. Place the pump down slowly on the suction port!**  
**NOTICE! If the pump cannot be placed level on the suction port, use appropriate adjustment plates. In order for the motor to be lifted without any problem, the pump must be vertical.**

3. Mark the motor/hydraulics position on the housing.

4. Loosen and remove hexagon nuts on the hydraulics housing.

5. Slowly lift the motor and pull it off the threaded bolts.

**CAUTION! Lift the motor vertically and do not tilt! The threaded bolts will be damaged if tilted!**

6. Swivel the motor over the new hydraulics housing.

7. Slowly drain the motor. Make sure that the motor/hydraulic markings match and the threaded bolts screw exactly into the holes.

8. Screw hexagon nuts and connect the motor to the hydraulics firmly. **NOTICE! Observe the tightening torques in the appendix!**

► Hydraulics housing changed. Pump can be reinstalled.

**WARNING! If the pump is placed in temporary storage and the lifting equipment dismantled, secure the pump against falling over and slipping!**

### 9.7.4 SOLID G- and Q impeller: Readjusting the suction port

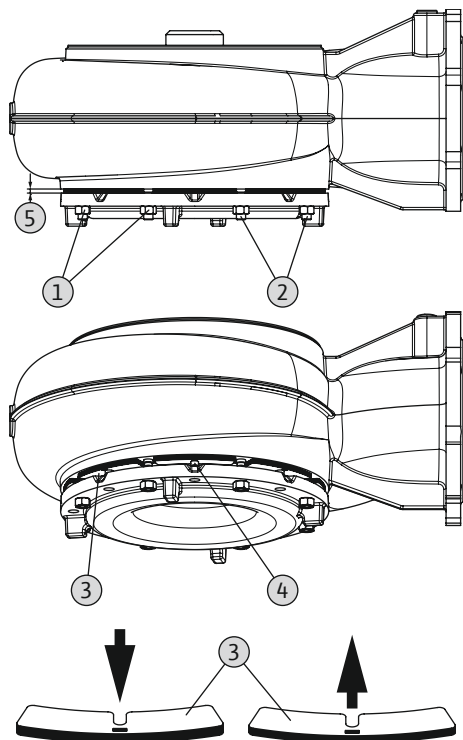


Fig. 27: SOLID G: Readjusting the gap

- |   |   |
|---|---|
| 1 | Hexagon nut for suction port attachment         |
| 2 | Threaded bolt                                   |
| 3 | Laminated core                                  |
| 4 | Laminated core fastening screw                  |
| 5 | Gap between suction port and hydraulics housing |
- ✓ Lifting equipment with sufficient bearing capacity is present.
  - ✓ Protective equipment has been put on.
1. Attach lifting equipment with suitable lifting gear to the attachment point of the pump.
  2. Lift the pump so that the pump is approx. 50 cm (20 in) above the ground.
  3. Loosen the hexagon nuts for fixation of the suction port. Unscrew the hexagon nut until the hexagon nut is flush with the threaded bolt.  
**WARNING! Risk of crushing fingers! The suction port can stick on the hydraulics housing due to encrustations and slide down suddenly. Loosen the nuts only in a crosswise manner and grasp them from the bottom. Wear protective gloves!**
  4. Suction port is on the hexagon nuts. If the suction port sticks to the hydraulics housing, carefully loosen the suction port with a wedge!
  5. Clean the sliding surface and the screwed-on laminated cores and disinfect (if necessary).
  6. Loosen the screws from the laminated cores and remove the individual laminated cores.
  7. Slowly re-tighten the three hexagon nuts crosswise until the suction port is in contact with the impeller. **CAUTION! Only tighten the hexagon nuts by hand! If the hexagon nuts are excessively tightened, the impeller and the motor bearings may get damaged!**
  8. Measure the gap between the suction port and hydraulics housing.
  9. Adjust the laminated cores according to the measured dimensions and add another metal sheet.
  10. Unscrew the three hexagon nuts again until the hexagon nuts are flush with the threaded bolt.
  11. Reinsert the laminated cores and screw into place.
  12. Tighten the hexagon nuts crosswise until the suction port is flush with the laminated cores.
  13. Firmly tighten the hexagon nuts crosswise. **Observe the tightening torques in the appendix!**
  14. Reach into the suction port from below and turn the impeller. When the gap is correctly set, the impeller can be rotated. If the gap is too small, the impeller is difficult to rotate. Repeat setting. **WARNING! Danger of amputation of limbs! Sharp edges can form on the suction port and impeller. Wear safety gloves to protect against cuts!**
- Suction port correctly set. Pump can be reinstalled.

## 10 Faults, causes and remedies

**DANGER****Danger due to fluids hazardous to health!**

Danger of death in case of pumps with fluids hazardous to health! Wear the following protective equipment while performing the work:

- Closed safety goggles
- Breathing mask
- Protective gloves

⇒ The equipment listed here is the minimum requirement, observe the specifications of the work regulations! The operator must make sure that the personnel have received and read the work regulations!

**DANGER****Risk of death due to electrocution!**

Improper conduct when carrying out electrical work can lead to death due to electric shock! Electrical work must be carried out by a qualified electrician in accordance with the locally applicable regulations.

**DANGER****Risk of fatal injury due to dangerous lone working practices!**

Work in chambers and narrow rooms as well as work involving risk of falling are dangerous work. Such work may not be carried out autonomously! A second person must be present for safety reasons.

**WARNING****No persons are allowed to be present inside the working area of the pump!**

Persons may suffer (serious) injuries while the pump is in operation! No persons may therefore be present inside the working area. If persons must enter the working area of the pump, the pump must be decommissioned and secured against being switched on again without authorisation.

**WARNING****Sharp edges on the impeller and suction port!**

Sharp edges can form on the impeller and suction port. There is danger of limbs being severed! Protective gloves must be worn to protect from cuts.

**Fault: Pump does not start**

1. Electricity supply interrupted or short-circuit/earth fault in the cable or motor winding.
  - ⇒ Have the connection and motor checked by a qualified electrician and replace if necessary.
2. Tripping of fuses, of the motor protection switch or the monitoring device
  - ⇒ Have the connection and the monitoring device checked by a qualified electrician and change it if necessary.
  - ⇒ Have the motor protection switches and fuses installed and adjusted according to the technical specifications by a qualified electrician and reset monitoring device.
  - ⇒ Check the impeller to make sure that it runs smoothly, clean the hydraulics if necessary.
3. The sealing chamber control (optional) has interrupted the electric circuit (connection-related)

- ⇒ See “Fault: Mechanical seal leakage, sealing chamber control reports a fault and switches the pump off”.

**Fault: Pump starts up, motor protection trips after short period**

1. Motor protection switch set incorrectly.
  - ⇒ Have the adjustment of the trigger checked and corrected by a qualified electrician.
2. Increased power consumption due to major voltage drop.
  - ⇒ Have the voltage of individual phases checked by a qualified electrician. Contact the electricity distribution network.
3. There are only two phases at the connection.
  - ⇒ Have the connection checked and corrected by a qualified electrician.
4. Excessive differences in voltage between the phases.
  - ⇒ Have the voltage of individual phases checked by a qualified electrician. Contact the electricity distribution network.
5. Incorrect direction of rotation.
  - ⇒ Have the connection corrected by a qualified electrician.
6. Increased power consumption through jammed hydraulics.
  - ⇒ Clean the hydraulics and check the inlet.
7. The density of the fluid is too high.
  - ⇒ Contact customer service.

**Fault: Pump runs, there is no volume flow**

1. There is no fluid.
  - ⇒ Check the inlet, open all gate valves.
2. Inlet clogged.
  - ⇒ Check the inlet and remove clogging.
3. Hydraulics jammed.
  - ⇒ Clean the hydraulics.
4. Pipe system on the pressure side or pressure hose clogged.
  - ⇒ Remove clogging and replace the damaged components if necessary.
5. Intermittent operation.
  - ⇒ Check the switching system.

**Fault: Pump starts, duty point is not reached**

1. Inlet clogged.
  - ⇒ Check the inlet and remove clogging.
2. Slide valves on the pressure side closed.
  - ⇒ Open all gate valves completely.
3. Hydraulics jammed.
  - ⇒ Clean the hydraulics.
4. Incorrect direction of rotation.
  - ⇒ Have the connection corrected by a qualified electrician.
5. Air cushion in the pipe system.
  - ⇒ Vent the pipe system.
  - ⇒ If air cushions occur frequently: Locate and prevent the air intake, if required install ventilation systems at specified locations.
6. Pump pumping against excessive pressure.
  - ⇒ Open all gate valves on the pressure side completely.
  - ⇒ Check the impeller shape, use other impeller shapes if required. Contact customer service.
7. Signs of wear on the hydraulics.

- ⇒ Have the components (impeller, suction port, pump housing) checked and replaced by customer service.
- 8. Pipe system on the pressure side or pressure hose clogged.
  - ⇒ Remove clogging and replace the damaged components if necessary.
- 9. Strongly gassing fluid.
  - ⇒ Contact customer service.
- 10. There are only two phases at the connection.
  - ⇒ Have the connection checked and corrected by a qualified electrician.
- 11. Excessive decrease in the fill level during operation.
  - ⇒ Check supply/capacity of the system.
  - ⇒ Have the switching points of the level control checked and adjusted if necessary.

**Fault: The pump does not run smoothly and is noisy**

1. Improper duty point.
  - ⇒ Check the pump configuration and the duty point, contact customer service.
2. Hydraulics jammed.
  - ⇒ Clean the hydraulics.
3. Strongly gassing fluid.
  - ⇒ Contact customer service.
4. There are only two phases at the connection.
  - ⇒ Have the connection checked and corrected by a qualified electrician.
5. Incorrect direction of rotation.
  - ⇒ Have the connection corrected by a qualified electrician.
6. Signs of wear on the hydraulics.
  - ⇒ Have the components (impeller, suction port, pump housing) checked and replaced by customer service.
7. Motor bearings have worn.
  - ⇒ Inform customer service; send the pump back to the factory for overhauling.
8. Pump is installed under tension.
  - ⇒ Check installation, install rubber compensators if necessary.

**Fault: Sealing chamber control reports fault or switches the pump off**

1. Condensation water build-up due to extended storage or high temperature fluctuations.
  - ⇒ Operate the pump for a short period (max. 5 min.) without pencil electrode.
2. Increased leakage when running in new mechanical seals.
  - ⇒ Change the oil.
3. Pencil electrode cable is defective.
  - ⇒ Replace the pencil electrode.
4. Mechanical seal is defective.
  - ⇒ Inform customer service.

**Further steps for troubleshooting**

If the points listed here do not rectify the fault, contact customer service. Customer service can assist in the following ways:

- Telephone or written support.
- On-site support.
- Inspection and repair at the factory.

Costs may be incurred if you request customer services! Please contact customer services for more information.

## 11 Spare parts

Spare parts are ordered via customer service. To avoid return queries and incorrect orders, the serial or article number must always be supplied. **Subject to change without prior notice!**

## 12 Disposal

### 12.1 Oils and lubricants

Operating fluid must be collected in suitable tanks and disposed of in accordance with the locally applicable guidelines. Wipe up drips immediately!

### 12.2 Protective clothing

Used protective clothing must be disposed off in accordance with the locally applicable guidelines.

### 12.3 Information on the collection of used electrical and electronic products

Proper disposal and appropriate recycling of this product prevents damage to the environment and danger to your personal health.



#### NOTICE

#### Disposal in domestic waste is forbidden!

In the European Union, this symbol can appear on the product, the packaging or the accompanying documentation. It means that the electrical and electronic products in question must not be disposed of along with domestic waste.

To ensure proper handling, recycling and disposal of the used products in question, please note the following points:

- Only hand over these products at designated, certified collecting points.
- Observe the locally applicable regulations!

Please consult your local municipality, the nearest waste disposal site, or the dealer who sold the product to you for information on proper disposal. Further recycling information at [www.wilo-recycling.com](http://www.wilo-recycling.com).

## 13 Appendix

### 13.1 Tightening torques

Rust-free screws A2/A4			
Threaded	Tightening torque		
	Nm	kp m	ft·lb
M5	5.5	0.56	4
M6	7.5	0.76	5.5
M8	18.5	1.89	13.5
M10	37	3.77	27.5
M12	57	5.81	42
M16	135	13.77	100
M20	230	23.45	170
M24	285	29.06	210
M27	415	42.31	306
M30	565	57.61	417

Geomet-coated screws (strength 10.9) with Nord-Lock washer			
Threaded	Tightening torque		
	Nm	kp m	ft·lb
M5	9.2	0.94	6.8
M6	15	1.53	11
M8	36.8	3.75	27.1
M10	73.6	7.51	54.3
M12	126.5	12.90	93.3

Geomet-coated screws (strength 10.9) with Nord-Lock washer			
Threaded	Tightening torque		
	Nm	kp m	ft·lb
M16	155	15.81	114.3
M20	265	27.02	195.5

### 13.2 Operation with frequency converter

The motor in series design (confirming to IEC 60034-17) can be operated with a frequency converter. Contact customer service if the rated voltage is over 415 V/50 Hz or 480 V/60 Hz. Because of the additional heating caused by harmonics, the rated power of the motor must be around 10 % more than the power requirement of the pump. For frequency converters with a low-harmonic output, it may be possible to reduce the 10 % power reserve. A reduction of the harmonic waves is achieved with output filters. The frequency converter and filter must be compatible.

The configuration of the frequency converter depends on the rated motor current. Care must be taken to ensure that the pump operates without jerking or vibration, especially in the lower speed range. Otherwise, the mechanical seals can leak or be damaged. The flow rate in the pipe must also be observed. If the flow rate is too low, the greater the risk is of solids depositing in the pump and piping. A minimum flow rate of 0.7 m/s (2.3 ft/s) with a pumping pressure of 0.4 bar (6 psi) is recommended.

It is important that the pump operates across the entire control range without vibrations, resonance, oscillation or excessive noise. Increased motor noise caused by the harmonics of the power supply is normal.

During parameterisation of the frequency converter, observe the setting of the quadratic pump curve (U/f curve) for pumps and fans! The U/f curve ensures that the output voltage at frequencies less than the rated frequency (50 Hz or 60 Hz) is adjusted to the power requirement of the pump. Newer frequency converters feature an automatic power optimisation function – this automation achieves the same effect. For the frequency converter setting, refer to its installation and operating instructions.

Faults with the motor monitoring may occur on motors operated with a frequency converter depending on the type used and installation conditions present. The following measures can help to reduce or avoid these faults:

- Keeping within the limit values stated in IEC 60034-25 for overvoltages and rise speed. Output filters may need to be installed.
- Vary the pulse frequency of the frequency converter.
- In the event of a fault on the internal sealing chamber control, use the external double-rod electrode.

The following construction measures can also help to reduce or prevent faults:

- Separate power supply cables for the main and control cable (depending on the motor size).
- When laying, ensure there is adequate clearance between the main and control cable.
- Using shielded power supply cables.

#### Summary

- Continuous duty up to rated frequency (50 Hz or 60 Hz), observing the minimum flow velocity.
- Observe additional measures with regard to EMC regulations (choice of frequency converter, using filters, etc.).
- Never exceed the rated current or rated speed of the motor.
- It must be possible to connect the motor's own temperature monitoring (bimetallic strip or PTC sensor).

### 13.3 Ex rating

This section contains further information on the operation of the pump in an explosive atmosphere. All personnel must read this section. **This section applies only to Ex-rated pumps!**

#### 13.3.1 Identification of Ex-rated pumps

For use in explosive atmospheres, the pump must be marked as follows on the rating plate:

- "Ex" symbol of the corresponding approval
- Ex classification
- Certification number (depending on the approval)

The certification number, if required by the approval, is printed on the rating plate.

### 13.3.2 Protection class

The motor's design version corresponds to the following protection classes:

- Flameproof enclosure (ATEX)
- Explosionproof (FM)
- Flameproof enclosures (CSA-EX)

In order to limit the surface temperature, the motor must be equipped with at least one temperature limiter (1-circuit temperature monitoring). It may also be equipped with a temperature controller (2-circuit temperature monitoring).

### 13.3.3 Intended use



#### **DANGER**

#### **Explosion due to pumping of explosive fluids!**

Pumping of highly flammable and explosive fluids (gasoline, kerosene, etc.) in pure form is strictly prohibited. There is a risk of fatal injury due to explosion! The pumps are not designed for these fluids.

#### **ATEX approval**

The pumps are suitable for operation in potentially explosive atmospheres:

- Device group: II
- Category: 2, zone 1 and zone 2

**These pumps must not be used in zone 0!**

#### **FM approval**

The pumps are suitable for operation in potentially explosive atmospheres:

- Protection class: Explosionproof
- Category: Class I, Division 1

Notice: If the cabling is carried out according to Division 1, installation in Class I, Division 2 is also permitted.

#### **CSA-Ex-rating according to division (Motor T 12, T 13, T 17, T 17.2, T 20, T 34)**

The pumps are suitable for operation in potentially explosive atmospheres:

- Protection class: Explosion-proof
- Category: Class I Division 1

#### **CSA-Ex-rating according to zone (Motor T 24, T 30)**

The pumps are suitable for operation in potentially explosive atmospheres:

- Device group: II
- Category: 2, zone 1 and zone 2

**These pumps must not be used in zone 0!**

### 13.3.4 Electrical connection



#### **DANGER**

#### **Risk of death due to electrocution!**

Improper conduct when carrying out electrical work can lead to death due to electric shock! Electrical work must be carried out by a qualified electrician in accordance with the locally applicable regulations.

- Always connect the pump to an electrical outlet outside the explosive area. If the connection must be made within the explosive area, then the connection must be carried out in an Ex-rated housing (ignition protection class according to DIN EN 60079-0)! Non-observance may lead to fatal injury due to explosion! Connection must always be carried out by a qualified electrician.
- All monitoring devices outside the "spark-proof areas" must be connected via an intrinsically safe circuit (e.g. Ex-i relay XR-4...).

#### **Motors T 12, T 13, T 17, T 17.2, T 20, T 20.1, T 24, T 30, T 34, T 42**

- The voltage tolerance may not be higher than max.  $\pm 10\%$ .

#### **Motors T 49, T 50.1, T 56, T 57, T 63.x, T 72**

- The voltage tolerance may not be higher than max.  $\pm 5\%$ .



### Overview of monitoring devices

	T 12 ... T 17	T 20	T 20.1	T 24 ... T 42	T 49, T 56	T 50, T 50.1, T 57.1, T 63.1	T 63.2, T 72
Internal monitoring devices							
Motor compartment	•	–	–	–	–	–	–
Terminal room/motor compartment	–	–	•	•	•	•	•
Motor winding	•	•	•	•	•	•	•
Motor bearings	–	o	o	o	o	o	o
Sealing chamber	–	–	–	–	–	•	•
Leakage chamber	–	–	•	–	–	•	•
Vibration sensor	–	–	–	o	o	o	o
External monitoring devices							
Sealing chamber	o	o	o	o	o	o	o

• = standard-equipped , – = not available, o = optional

#### All the monitoring devices fitted must always be connected!

#### 13.3.4.1 Monitoring of motor compartment

The connection is made as described in the “Electrical connection” section.

#### 13.3.4.2 Monitoring of terminal room/motor compartment

The connection is made as described in the “Electrical connection” section.

#### 13.3.4.3 Terminal room, motor compartment and sealing chamber monitoring

The connection is made as described in the “Electrical connection” section.

#### 13.3.4.4 Monitoring of motor winding



#### DANGER

#### Risk of explosion due to overheating of the motor!

If the temperature limiter is connected incorrectly, there is a risk of explosion due to overheating of the motor! Always connect the temperature limiter to a manual re-activation lock. This means that a “release button” must be manually activated!

The motor is equipped with a temperature limit (1-circuit temperature monitoring). As an option, the motor can be fitted with a temperature control and limit function (2-circuit temperature monitoring).

Depending on the version of the thermal motor monitoring, the following triggering status must occur when the threshold value is reached:

- Temperature limiter (1 temperature circuit):  
When the threshold is reached, deactivation **with reactivation lock** must take place!
- Temperature controller and limiter (2 temperature circuits):  
When the threshold for the low temperature is reached, the motor can deactivate with automatic reactivation. When the threshold for the high temperature is reached, the motor must deactivate **with reactivation lock!**

**CAUTION! Motor damage due to overheating! In the event of automatic reactivation, comply with the specifications for the maximum switching frequency and switching break!**

#### Connection of the thermal motor monitoring

- Connect the bimetallic strip via an evaluation relay. Relay “CM-MSS” is recommended for this. The threshold is preset.  
Connection values: max. 250 V(AC), 2.5 A,  $\cos \varphi = 1$

### 13.3.4.5 Leakage chamber monitoring

- Connect the PTC sensor via an evaluation relay. Relay “CM-MSS” is recommended for this. The threshold is preset.

Connect the float switch using an evaluation relay! Relay “CM-MSS” is recommended for this. The threshold is already pre-set.

### 13.3.4.6 Monitoring of motor bearing

The connection is made as described in the “Electrical connection” section.

### 13.3.4.7 Sealing chamber monitoring (external electrode)

- Connect the external pencil electrode via an Ex-rated evaluation relay! Relay “XR-4...” is recommended for this. The threshold is 30 kOhm.
- The connection must be made using an intrinsically safe circuit!

### 13.3.4.8 Frequency converter operation

- Type of converter: Pulse-width modulation
- Continuous duty: 30 Hz up to rated frequency (50 Hz or 60 Hz). Comply with the minimum flow velocity!
- Min. switching frequency: 4 kHz
- Max. overvoltages on the terminal board: 1350 V
- Output current on the frequency converter: max. 1.5 times rated current
- Max. overload time: 60 s
- Torque applications: quadratic pump curve  
Speed/torque curves required are available on request!
- Observe additional measures with regard to EMC regulations (choice of frequency converter, filters, etc.).
- Never exceed the rated current or rated speed of the motor.
- It must be possible to connect the motor’s own temperature monitoring (bimetallic strip or PTC sensor).
- If the temperature class is marked as T4/T3, temperature class T3 applies.

## 13.3.5 Commissioning



### DANGER

#### Risk of explosion when using non Ex-rated pumps!

Pumps without Ex rating may not be used in potentially explosive areas! There is a risk of fatal injury due to explosion! Only use pumps which have the appropriate Ex labelling on the rating plate within potentially explosive areas.



### DANGER

#### Risk of explosion due to flying sparks in the hydraulics!

During operation the hydraulics must be flooded (completely filled with the fluid). If the volume flow is interrupted or the hydraulics emerges, air cushions can form in the hydraulics. If this happens, there is a risk of explosion, e.g. flying sparks due to static charge! Dry-running protection must ensure that the pump is deactivated at the appropriate level.



### DANGER

#### There is a risk of explosion if dry-running protection is connected incorrectly!

If the pump is operated within an explosive atmosphere, the dry-running protection must have a separate signal transmitter (redundant protection of the level control). Pump deactivation must be performed with a manual reactivation lock!

- The operator is responsible for defining the potentially explosive area.
- Only pumps with corresponding Ex rating may be used within a potentially explosive area.
- Pumps with Ex rating must be labelled on the rating plate.
- Do not exceed the **maximum fluid temperature!**
- Dry running of the pump must be prevented! Ensure on-site (dry-running protection) that emerging of the hydraulics is prevented.  
According to DIN EN 50495, a safety device with SIL level 1 and hardware fault tolerance 0 must be provided for category 2.

## 13.3.6 Maintenance and repair

- Carry out maintenance tasks according to the regulations.

- Only carry out maintenance tasks mentioned in these installation and operating instructions.
- The spark-proof gaps may **only** be repaired according to the manufacturer's design specifications. It is **not** permitted to carry out repairs according to the values in tables 1 and 2 of DIN EN 60079-1.
- Only use screw plugs as stipulated by the manufacturer, that at least correspond to a strength class of 600 N/mm<sup>2</sup> (38.85 long tons-force/inch<sup>2</sup>).

#### 13.3.6.1 Repair of housing coating

The paint layer can become electrostatically charged in case of thicker coats. **DANGER! Risk of explosion! In explosive atmospheres, a discharge can cause an explosion!**

If the housing coating has to be repaired, the maximum coat thickness is 2 mm (0.08 in)!

#### 13.3.6.2 Changing the mechanical seal

Changing the seal on the fluid and motor side is strictly prohibited!

#### 13.3.6.3 Replacing the connection cable

Changing the connection cable is strictly prohibited!







## Wilo – International (Subsidiaries)

### Argentina

WILO SALMSON  
Argentina S.A.  
C1295ABI Ciudad  
Autónoma de Buenos Aires  
T +54 11 4361 5929  
matias.monea@wilo.com.ar

### Australia

WILO Australia Pty Limited  
Murrarie, Queensland, 4172  
T +61 7 3907 6900  
chris.dayton@wilo.com.au

### Austria

WILO Pumpen Österreich  
GmbH  
2351 Wiener Neudorf  
T +43 507 507-0  
office@wilo.at

### Azerbaijan

WILO Caspian LLC  
1065 Baku  
T +994 12 5962372  
info@wilo.az

### Belarus

WILO Bel IOOO  
220035 Minsk  
T +375 17 3963446  
wilo@wilo.by

### Belgium

WILO NV/SA  
1083 Ganshoren  
T +32 2 4823333  
info@wilo.be

### Bulgaria

WILO Bulgaria EOOD  
1125 Sofia  
T +359 2 9701970  
info@wilo.bg

### Brazil

WILO Comercio e  
Importacao Ltda  
Jundiaí – São Paulo – Brasil  
13.213-105  
T +55 11 2923 9456  
wilo@wilo-brasil.com.br

### Canada

WILO Canada Inc.  
Calgary, Alberta T2A 5L7  
T +1 403 2769456  
info@wilo-canada.com

### China

WILO China Ltd.  
101300 Beijing  
T +86 10 58041888  
wiloobj@wilo.com.cn

### Croatia

WILO Hrvatska d.o.o.  
10430 Samobor  
T +38 51 3430914  
wilo-hrvatska@wilo.hr

### Cuba

WILO SE  
Oficina Comercial  
Edificio Simona Apto 105  
Siboney. La Habana. Cuba  
T +53 5 2795135  
T +53 7 272 2330  
raul.rodriguez@wilo-cuba.com

### Czech Republic

WILO CS, s.r.o.  
25101 Cestlice  
T +420 234 098711  
info@wilo.cz

### Denmark

WILO Nordic  
Drejergangen 9  
DK-2690 Karlslunde  
T +45 70 253 312  
wilo@wilo.dk

### Estonia

WILO Eesti OÜ  
12618 Tallinn  
T +372 6 509780  
info@wilo.ee

### Finland

WILO Nordic  
Tillinmäentie 1 A  
FIN-02330 Espoo  
T +358 207 401 540  
wilo@wilo.fi

### France

Wilo Salmson France S.A.S.  
53005 Laval Cedex  
T +33 2435 95400  
info@wilo.fr

### United Kingdom

WILO (U.K.) Ltd.  
Burton Upon Trent  
DE14 2WJ  
T +44 1283 523000  
sales@wilo.co.uk

### Greece

WILO Hellas SA  
4569 Anixi (Attika)  
T +302 10 6248300  
wilo.info@wilo.gr

### Hungary

WILO Magyarország Kft  
2045 Törökbálint  
(Budapest)  
T +36 23 889500  
wilo@wilo.hu

### India

Wilo Mather and Platt Pumps  
Private Limited  
Pune 411019  
T +91 20 27442100  
services@matherplatt.com

### Indonesia

PT. WILO Pumps Indonesia  
Jakarta Timur, 13950  
T +62 21 7247676  
citrawilo@cbn.net.id

### Ireland

WILO Ireland  
Limerick  
T +353 61 227566  
sales@wilo.ie

### Italy

WILO Italia s.r.l.  
Via Novegro, 1/A20090  
Segrate MI  
T +39 25538351  
wilo.italia@wilo.it

### Kazakhstan

WILO Central Asia  
050002 Almaty  
T +7 727 312 40 10  
info@wilo.kz

### Korea

WILO Pumps Ltd.  
20 Gangseo, Busan  
T +82 51 950 8000  
wilo@wilo.co.kr

### Latvia

WILO Baltic SIA  
1019 Riga  
T +371 6714-5229  
info@wilo.lv

### Lebanon

WILO LEBANON SARL  
Jdeideh 1202 2030  
Lebanon  
T +961 1 888910  
info@wilo.com.lb

### Lithuania

WILO Lietuva UAB  
03202 Vilnius  
T +370 5 2136495  
mail@wilo.lt

### Morocco

WILO Maroc SARL  
20250 Casablanca  
T +212 (0) 5 22 66 09 24  
contact@wilo.ma

### The Netherlands

WILO Nederland B.V.  
1551 NA Westzaan  
T +31 88 9456 000  
info@wilo.nl

### Norway

WILO Nordic  
Alf Bjerckes vei 20  
NO-0582 Oslo  
T +47 22 80 45 70  
wilo@wilo.no

### Poland

WILO Polska Sp. z o.o.  
5-506 Lesznowola  
T +48 22 7026161  
wilo@wilo.pl

### Portugal

Bombas Wilo-Salmson  
Sistemas Hidraulicos Lda.  
4475-330 Maia  
T +351 22 2080350  
bombas@wilo.pt

### Romania

WILO Romania s.r.l.  
077040 Com. Chiajna  
Jud. Ilfov  
T +40 21 3170164  
wilo@wilo.ro

### Russia

WILO Rus ooo  
123592 Moscow  
T +7 496 514 6110  
wilo@wilo.ru

### Saudi Arabia

WILO Middle East KSA  
Riyadh 11465  
T +966 1 4624430  
wshoula@wataniaind.com

### Serbia and Montenegro

WILO Beograd d.o.o.  
11000 Beograd  
T +381 11 2851278  
office@wilo.rs

### Slovakia

WILO CS s.r.o., org. Zložka  
83106 Bratislava  
T +421 2 33014511  
info@wilo.sk

### Slovenia

WILO Adriatic d.o.o.  
1000 Ljubljana  
T +386 1 5838130  
wilo.adriatic@wilo.si

### South Africa

Wilo Pumps SA Pty LTD  
Sandton  
T +27 11 6082780  
gavin.bruggen wilo.co.za

### Spain

WILO Ibérica S.A.  
28806 Alcalá de Henares  
(Madrid)  
T +34 91 8797100  
wilo.iberica@wilo.es

### Sweden

WILO NORDIC  
Isbjörnsvägen 6  
SE-352 45 Växjö  
T +46 470 72 76 00  
wilo@wilo.se

### Switzerland

Wilo Schweiz AG  
4310 Rheinfelden  
T +41 61 836 80 20  
info@wilo.ch

### Taiwan

WILO Taiwan CO., Ltd.  
24159 New Taipei City  
T +886 2 2999 8676  
nelson.wu@wilo.com.tw

### Turkey

WILO Pompa Sistemleri  
San. ve Tic. A.Ş.  
34956 İstanbul  
T +90 216 2509400  
wilo@wilo.com.tr

### Ukraine

WILO Ukraine t.o.w.  
08130 Kiev  
T +38 044 3937384  
wilo@wilo.ua

### United Arab Emirates

WILO Middle East FZE  
Jebel Ali Free zone – South  
PO Box 262720 Dubai  
T +971 4 880 91 77  
info@wilo.ae

### USA

WILO USA LLC  
Rosemont, IL 60018  
T +1 866 945 6872  
info@wilo-usa.com

### Vietnam

WILO Vietnam Co Ltd.  
Ho Chi Minh City, Vietnam  
T +84 8 38109975  
nkminh@wilo.vn

# wilo

Pioneering for You

WILO SE  
Nortkirchenstr. 100  
44263 Dortmund  
Germany  
T +49 (0)231 4102-0  
T +49 (0)231 4102-7363  
wilo@wilo.com  
www.wilo.com