Pioneering for You

Wilo DD-I

zh-CHS 安装及操作说明

en Installation and operating instructions

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目录表

1 概述

1.1 关于本说明书

本说明书是产品的固定组成部分。遵守本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：
→ 在执行所有工作前或使用产品前请仔细阅读本说明书。
→ 请妥善保管说明书，以备随时使用。
→ 另外注意遵守产品上标注的所有产品相关参数和标识。

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

1.3 网络连接 (LAN)

本产品应连接到本地以太网 (LAN) 才能确保正常运作（配置或运行）。以太网存在无授权访问网络的危险。本产品通过这种方式可受到人为干预。因此除法律法规或其他网络内部规定以外，还须遵守以下要求：
→ 禁用无用的信道。
→ 为访问设定安全密码。
→ 立刻更换厂方初始密码。
→ 另安装安全应用程序进行保护。
→ 采用符合最新 IT 安全要求和现行标准的防护措施（如设置 VPN 进行远程访问）。

如果产品损坏或产品造成的损坏是由于网络连接或其访问问题而造成的，Wilo不承担任何责任。

1.4 软件功能范围

本说明完整地阐述了“Digital Data Interface”软件的功能范围。但根据订单确认书的约定，仅向客户介绍“Digital Data Interface”软件的功能范围。客户事后可自愿申请“Digital Data Interface”软件提供的其他功能。

1.5 个人隐私信息

使用本产品不牵涉到处理个人隐私信息。**注意！为了避免违反个人隐私保护法，安装和维护日志栏内不得登记个人隐私信息（如姓名、地址、电子邮箱地址、电话号码等信息）！**

1.6 保留更改权力

Wilo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。

1.7 保修和免责声明

Wilo对于如下情况，不承担任何保修义务或责任：
→ 应用现场没有稳定的可用网络
→ 由于技术性问题造成的（直接或间接）损失，如服务器故障，传输错误等
→ 第三方供应商提供的其他软件造成的损失
→ 受外部影响造成的损失，如黑客攻击，病毒软件等
→ 擅自对“Digital Data Interface”软件进行非法改动
→ 不遵守本说明书的内容
→ 未按规定使用
→ 不按规范存放或运输
→ 错误安装或拆卸

2 安全

2.1 工作人员资格鉴定

电气连接

工作人员必须满足以下前提条件：
→ 专业电工
→ 有关压接网线的网络知识

操作

操作人员在配置和运行水泵时必须满足以下前提条件：
→ 安全操作以网络为基础的英语用户界面
→ 以下领域的专业语言知识，尤其是英语
  – 电子技术，变频器专业领域
  – 水泵技术，水泵系统运行专业领域
  – 网络技术，网络组件的配置

“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。

2.2 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。
→ 将产品接地。
→ 遵守技术说明。
→ 接线电缆损坏后立刻进行更换。

2.3 功能安全性

如果在易爆环境内运行水泵，注意下列几项要求：
→ 安装干转保护，通过 Ex-i 连接评测继电器。
→ 通过齐纳安全栅连接液位传感器。
→ 通过一个有防爆许可的评测继电器连接电机过热保护。在与Wilo-EFC 相连时，可以在变频器中加装 PTC 热变电阻器卡“MCB 112”！
→ 与变频器、干转保护和电机过热保护一起连接在 Safe Torque Off (STO) 上。

***SIL* 级**

SIL-Level 1 安全装置，而且硬件必须达到零容错标准（依据 DIN EN 50495，类别 2）。在分析设备时，注意安全回路中的所有部件。必要的信息请参考各个部件的生产商说明书。

内置电容式传感器 CLP01 根据 2014/34/EU 指令进行了单独的型式测试。标识为：II 2G Ex db IIB Gb。

2.4 数据安全性

在将产品嵌入网络中时，要遵守针对网络，尤其是针对网络安全性的所有要求。为此买方或运营者必须遵守所有有效的国家以及国际准则（比如 Kritis 条例）或法律。

2.5 在关键安全应用中紧急运行

通过相应设备中输入的参数控制水泵以及变频器。另外在 LPI 和 LSI 模式下会覆盖变频器的水泵参数组 1。为快速排除故障，推荐创建并集中保存相应配置的备份。

注意！在关键安全应用中可以在变频器中保存另一项配置。在出现故障时，变频器可以通过该配置在紧急运行模式下继续运行。

3 产品说明

3.1 结构

Digital Data Interface 是一种集成在电机中的通讯模块，包括集成式网络服务器。通过用户图形界面，借助网络浏览器进行访问。通过用户界面可方便地配置、控制和监控水泵。为此可在水泵中安装不同的传感器。另外可通过外部控制的信号变送器将其他设备参数加载到控制装置中。Digital Data Interface 可根据系统模式：
→ 监控水泵。
→ 使用变频器控制水泵。
→ 控制有最多 4 台水泵的完整设备。

3.2 系统模式

可以为三种不同系统模式授权 Digital Data Interface：
→ 系统模式 DDI
  没有任何控制功能的系统模式。仅探测、分析和保存温度和震动传感器的值。通过运营者的上级控制装置控制水泵和变频器（如果有）。
→ 系统模式 LPI
  用于变频器和堵塞识别的有控制功能的系统模式。水泵/变频器组合作为一个单元工作，通过水泵控制变频器。这样可以进行堵塞识别，在需要时启动清洁过程。通过运营者的上级控制装置根据液位控制水泵。
→ 系统模式 LSI

这一系统模式用于完全控制有最多 4 台水泵的泵站。这时一台水泵作为主机工作，其他所有水泵作为从机工作。主泵根据与设备有关的参数控制其他所有水泵。

通过许可证密钥启用该系统模式。包括功能范围更小的系统模式。

3.3 与系统模式有关的功能概述

功能	系统模式		
	DDI	LPI	LSI
用户界面			
网络服务器	•	•	•
语言选择	•	•	•
用户密码	•	•	•
上传/下载配置	•	•	•
重置为工厂设定	•	•	•
数据显示			
铭牌数据	•	•	•
测试协议	o	o	o
安装日志	•	•	•
维护日志	•	•	•
数据收集和保存			
内部传感器	•	•	•
通过现场总线连接的内部传感器	•	•	•
变频器	–	•	•
泵站	–	–	•
接口			
外部输入/输出端支持	•	•	•
ModBus TCP	•	•	•
OPC UA	o	o	o
变频器的控制装置	–	•	•
控制和调节功能			
非浸入运行	–	•	•
堵塞识别/清洁过程	–	•	•
外部调节值（模拟/数字）	–	•	•
外部关闭	–	•	•
泵启动	–	•	•
干转保护	–	•	•
防洪	–	•	•
水泵更换	–	–	•
备用水泵	–	–	•
选择水泵运行模式	–	–	•
液位控制装置带液位传感器和浮子开关	–	–	•
PID 控制	–	–	•
冗余主泵	–	–	•
可选的停止液位	–	–	•
高效 (HE) 控制器	–	–	•

图例
– = 不可用，o = 可选，• = 可用

3.4 输入端

Digital Data Interface 有两个集成传感器和九个外部传感器接口。

内部传感器（机载）
→ 温度
探测 Digital Data Interface 当前的温度。
→ 振动
通过三个轴线上的 Digital Data Interface 探测当前的振动。

内部传感器（电机内）
→ 5x 温度 (Pt100, Pt1000, PTC)
→ 2x 模拟输入端 4–20 mA
→ 2x 振动传感器输入端（最多 2 个通道）

3.5 I/O 模块 – 额外的输入和输出端

为控制水泵/变频器组合（系统模式 LPI）或整台设备（系统模式 LSI），需要大量的测量数据。在正常情况下为变频器提供大量的模拟、数字输入和输出端。在需要时可以为输入和输出端补充两个 I/O 模块：
→ Wilo IO 1 (ET–7060)：6x 数字输入和输出端
→ Wilo IO 2 (ET–7002)：3x 模拟和 6x 数字输入端，3x 数字输出端

注意
系统模式 LSI 必须使用Wilo IO 2！
为探测所有所需的测量值，在设备规划中设计的是 Wilo IO 2 (ET–7002)！没有额外的 Wilo IO 2 无法控制系统。

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。

危险
接线错误存在爆炸风险！
如果在爆炸性气体危险环境内使用水泵，则接线错误可能导致爆炸风险。注意以下几点：
- 安装干转保护。
- 通过 Ex-i 评测继电器连接浮子开关。
- 通过齐纳安全栅连接液位传感器。
- 连接“Safe Torque Off (STO)”上的电机过热保护和干转保护。
- 注意章节“潜在爆炸环境中的电气连接”中的相关说明！

4.1 工作人员资格鉴定

工作人员必须满足以下前提条件：
→ 专业电工
→ 有关压接网线的网络知识

4.2 前提条件

与所使用系统模式有关的所需部件的概述：

前提条件	系统模式		
	DDI	LPI	LSI
无防爆功能安装			
有 Digital Data Interface 的水泵	•	•	•
24 VDC 控制电压	•	•	•
PTC 传感器的评估装置	•	•	•
有 Ethernet 模块“MCA 122”（ModBus TCP 模块）的变频器 Wilo-EFC	–	•	•
额定值或启/停规定的上级控制装置	–	•	o

前提条件	系统模式		
	DDI	LPI	LSI
干转保护浮子开关	–	o	o
用于额定值规定的液位传感器	–	–	•
网络开关（LAN 开关）	•	•	•
Wilo IO 1 (ET-7060)	o	o	–
Wilo IO 2 (ET-7002)	o	o	•
有防爆功能安装的额外要求			
为Wilo-EFC PTC 热变电阻器卡“MCB 112”或评估装置扩展 PTC 传感器防爆级	•	•	•
有防爆切断继电器的干转保护浮子开关	•	•	•
液位传感器的齐纳安全栅	–	–	•

图例
– = 不需要，o = 需要时，• = 必须有

4.3 Digital Data Interface 接线电缆

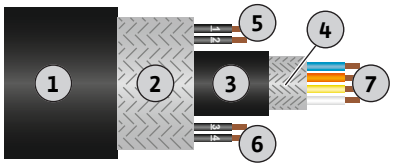


Fig. 1: 混合电缆示意图

说明

可使用混合电缆作为控制电缆。混合电缆将两种电缆统一为一体：
→ 控制电压和绕组保护的信号电缆
→ 网线

序号	芯线编号/芯线颜色	说明
1		外侧电缆包皮
2		外侧电缆屏蔽层
3		内侧电缆包皮
4		内侧电缆屏蔽层
5	1 = +	Digital Data Interface 电源连接芯线。工作电压：24 VDC（12–30 V FELV，最高 4.5 W）
	2 = –	
6	3/4 = PTC	电机绕组中的 PTC 传感器连接芯线。工作电压：2.5 至 7.5 VDC
7	白色 (wh) = RD+	准备网线，安装一同提供的 RJ45 插头。
	黄色 (ye) = TD+	
	橙色 (og) = TD–	
	蓝色 (bu) = RD–	

注意！ 大面积地放置电缆屏蔽层！

技术数据
→ 型号：TECWATER HYBRID DATA
→ 芯线，外侧电缆束：4x0.5 ST
→ 芯线，内侧电缆束：2x 2x22AWG
→ 材料：专用弹性体，辐射，耐水耐油，双层屏蔽
→ 直径：约 13.5 mm
→ 弯曲半径：81 mm
→ 最高水温：40 °C
→ 环境温度：-25 °C 至 40 °C

4.4 系统模式 DDI

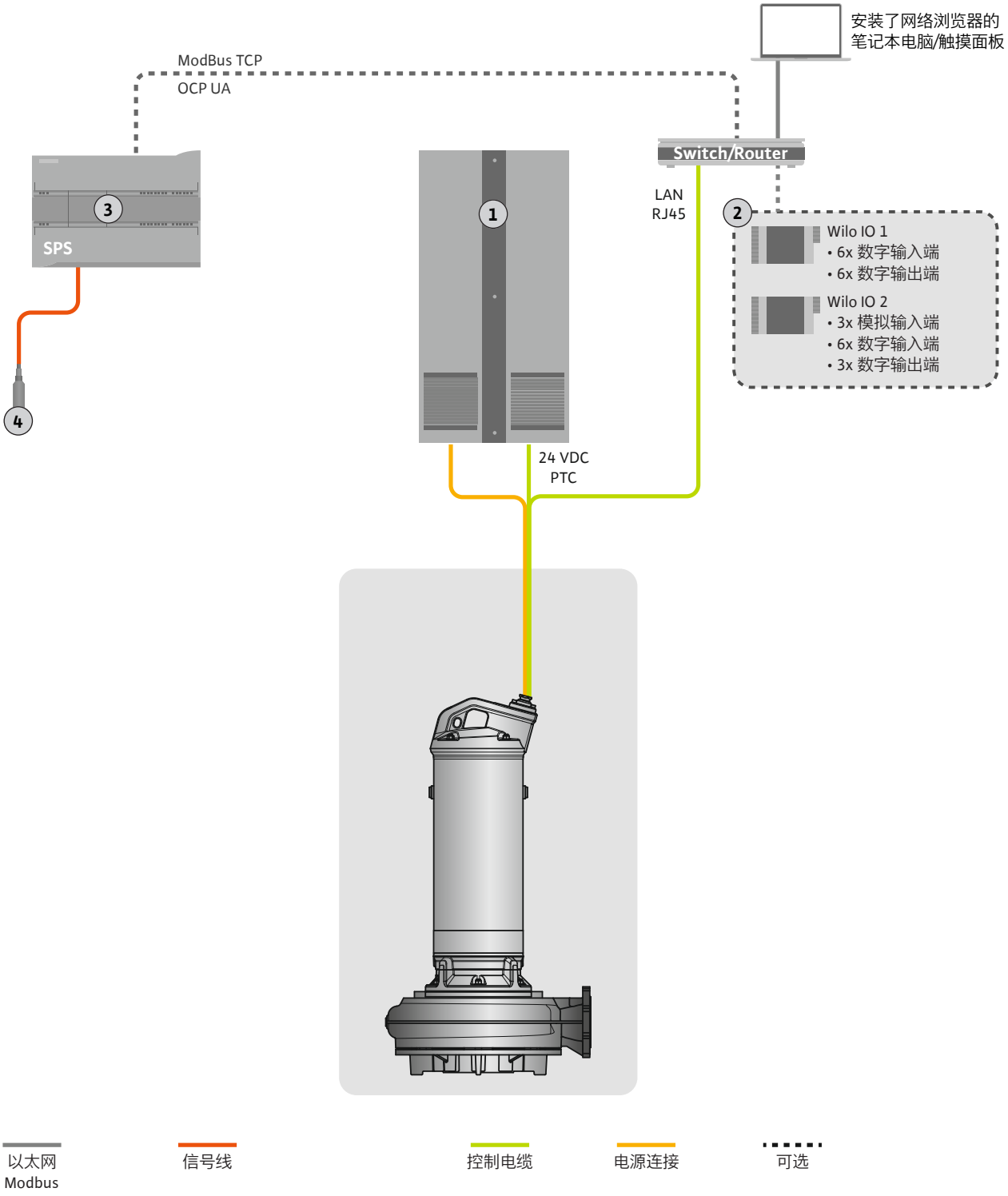


Fig. 2: 安装建议

1	控制柜
2	有数字和模拟输入/输出端的 I/O 模块
3	运营者方面，上级控制装置
4	液位传感器

4.4.1 水泵电源连接

将电机与现场的开关设备相连。有关电机接通方式和接口的信息请参考生产商说明书！

注意！ 大面积地放置电缆屏蔽层！

4.4.2 Digital Data Interface 电源连接

将 Digital Data Interface 的电源与现场的开关设备相连：
→ 工作电压：24 VDC（12-30 V FELV，最高 4.5 W）
→ 芯线 1: +
→ 芯线 2: -

4.4.3 电机绕组中的 PTC 传感器接口

通过电机绕组中的 Pt100 或 Pt1000 传感器在软件方面进行电机过热保护。可通过用户界面查看和设置当前温度值和极限温度。硬件方面安装的 PTC 传感器定义最高绕组温度，在紧急情况下关闭电机。

小心！ 执行功能检测！在连接 PTC 传感器之前，检查电阻器。使用电阻表测量温度传感器的电阻器。PTC 传感器的耐低温性介于 60 至 300 欧姆之间。

将 PTC 传感器与现场的开关设备相连：
→ 工作电压：2.5 至 7.5 VDC
→ 芯线：3 和 4
→ PTC 传感器的评测继电器，比如扩展Wilo-EFC PTC 热变电阻器卡“MCB 112”或“CM-MSS”继电器

危险

接线错误存在爆炸风险！

如未正确连接电机过热保护，在易爆区域内因爆炸存在生命危险！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！

4.4.4 网络接口

准备控制电缆的网线，安装一同提供的 RJ45 插头。与网络插座相连。

4.5 系统模式 LPI

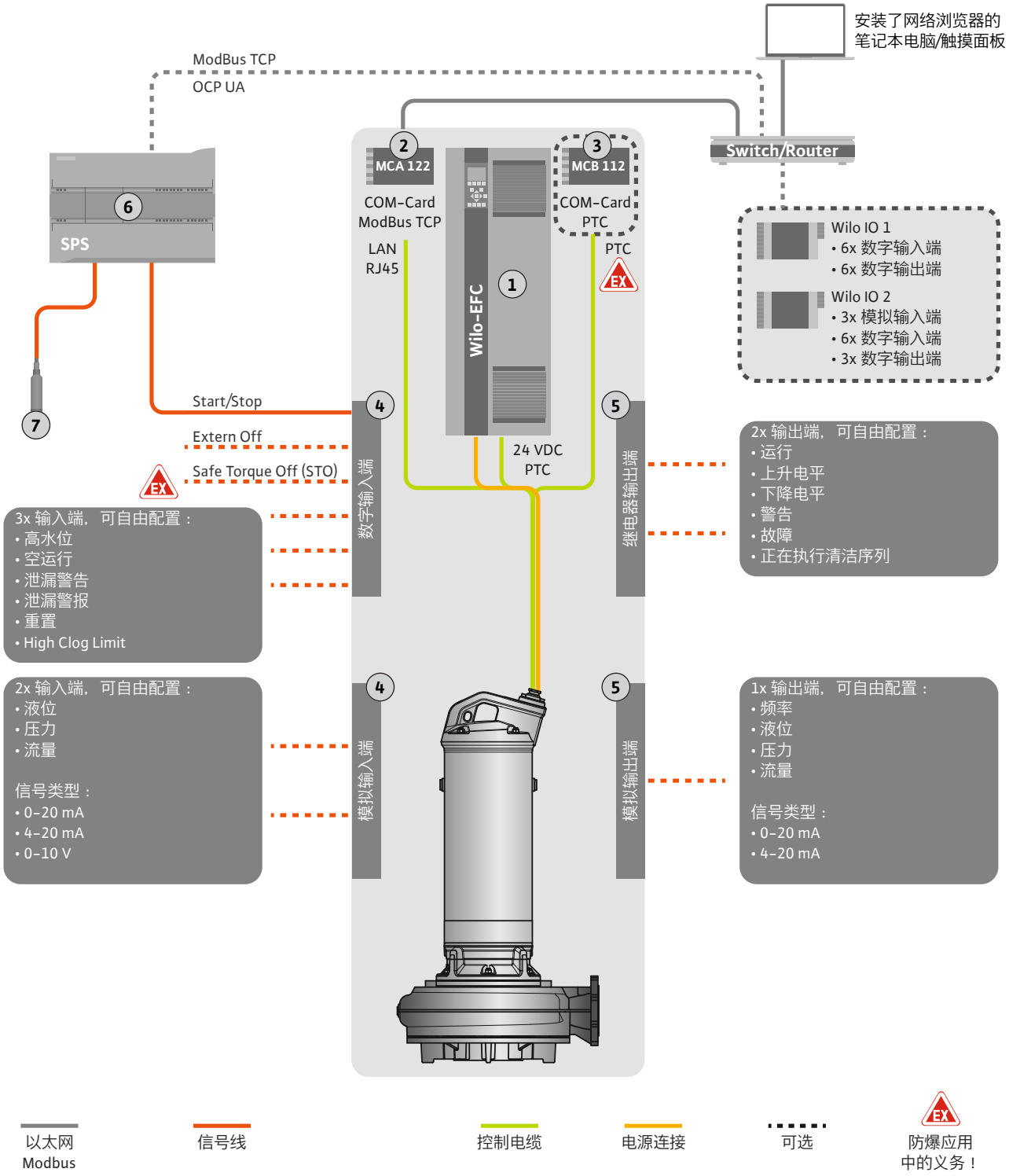


Fig. 3: 有启停功能的安装建议

1	变频器
2	变频器的“MCA 122”扩展模块（包括在供货范围内）
3	变频器的“MCB 112”扩展模块
4	变频器上的输入端
5	变频器上的输出端
6	运营者方面，上级控制装置
7	液位传感器

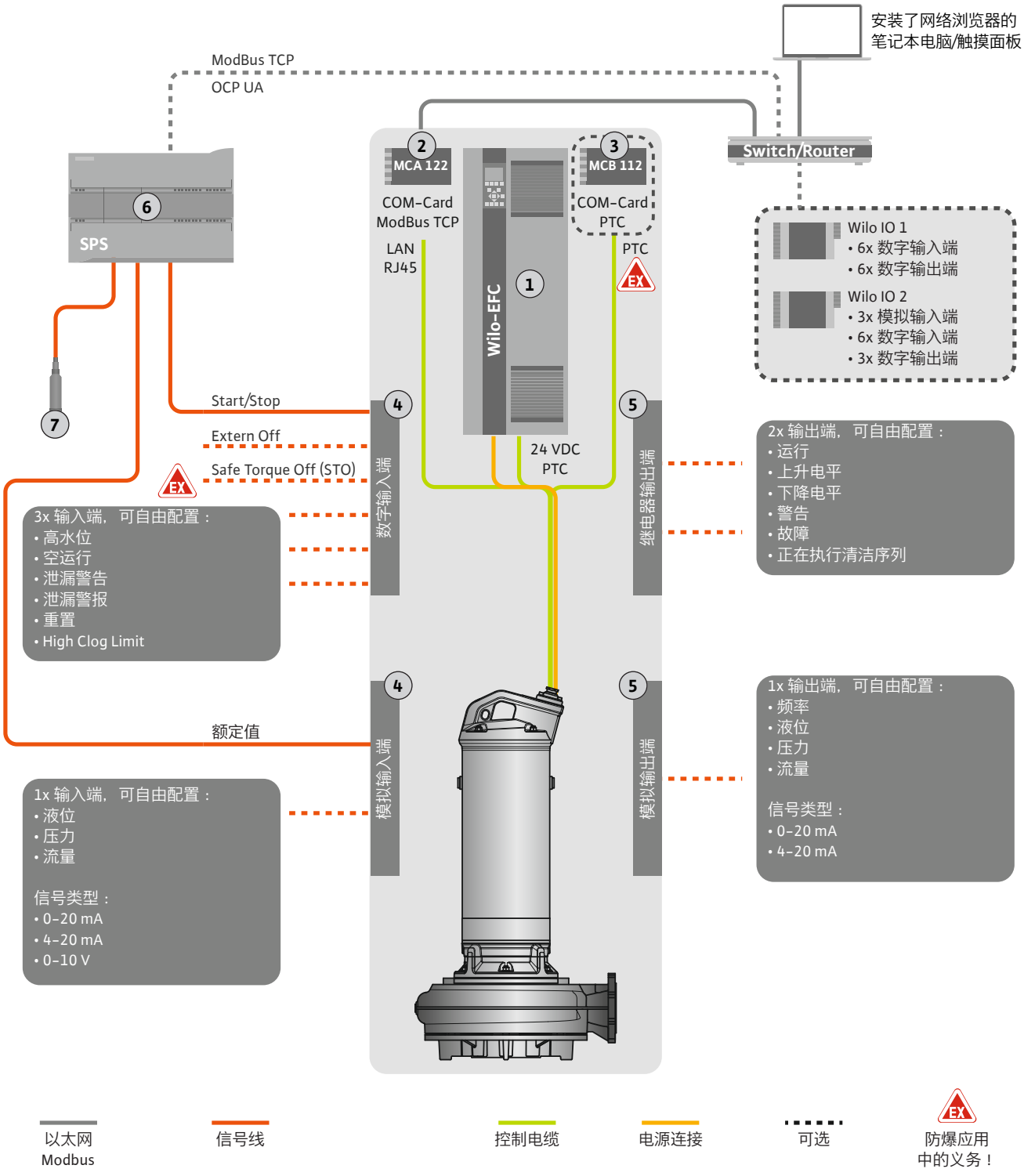


Fig. 4: 有模拟额定值规定的安装建议

1	变频器
2	变频器的“MCA 122”扩展模块（包括在供货范围内）
3	变频器的“MCB 112”扩展模块
4	变频器上的输入端
5	变频器上的输出端
6	运营者方面，上级控制装置
7	液位传感器

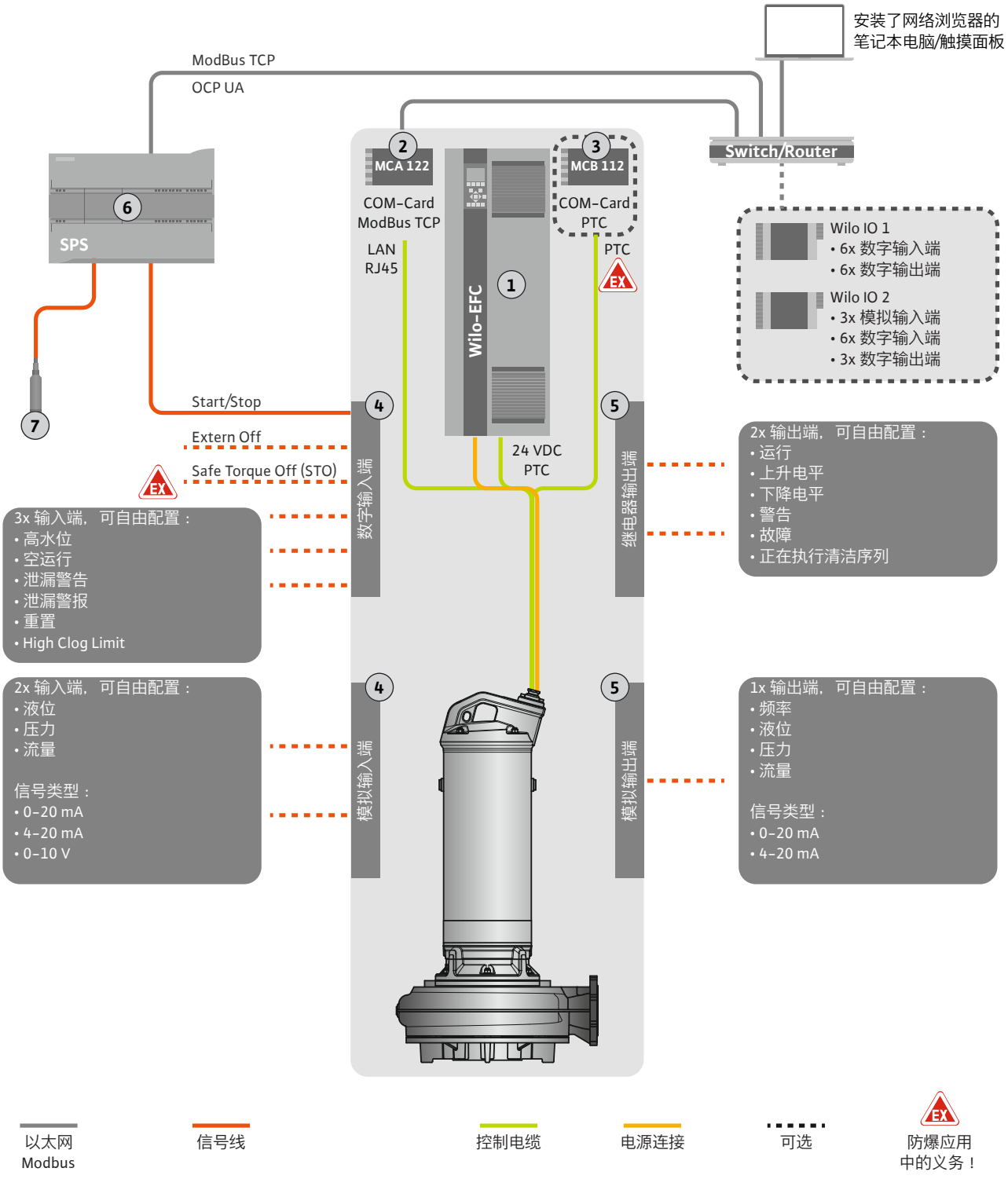


Fig. 5: 有 ModBus 的安装建议

1	变频器
2	变频器的“MCA 122”扩展模块（包括在供货范围内）
3	变频器的“MCB 112”扩展模块
4	变频器上的输入端
5	变频器上的输出端
6	运营者方面，上级控制装置
7	液位传感器

4.5.1 水泵电源连接

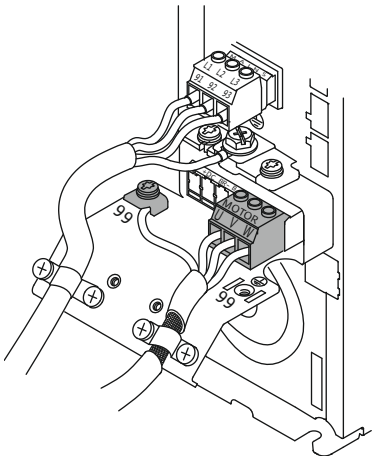


Fig. 6: 水泵接口：Wilo-EFC

变频器 ***Wilo-EFC***

端子	芯线名称
96	U
97	V
98	W
99	接地 (PE)

将电机接线电缆穿过电缆螺纹接头引入变频器中并进行固定。按照接线图连接芯线。

注意！ 大面积地放置电缆屏蔽层！

4.5.2 Digital Data Interface 电源连接

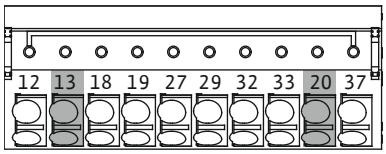


Fig. 7: 端子 Wilo-EFC

变频器 ***Wilo-EFC***

端子	控制电缆芯线	说明
13	1	电源：+24 VDC
20	2	电源：参考电势 (0 V)

4.5.3 电机绕组中的 PTC 传感器接口

变频器 ***Wilo-EFC***

危险

错误连接时有生命危险！

如果在爆炸性气体危险环境内使用水泵，请注意“潜在爆炸环境中的电气连接”章节！

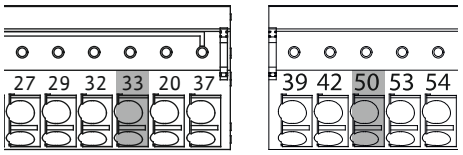


Fig. 8: 端子 Wilo-EFC

端子	控制电缆芯线	说明
50	3	+10 VDC 电源
33	4	数字输入端：PTC/WSK

通过电机绕组中的 Pt100 或 Pt1000 传感器在软件方面进行电机过热保护。可通过用户界面查看和设置当前温度值和极限温度。硬件方面安装的 PTC 传感器定义最高绕组温度，在紧急情况下关闭电机。

小心！ **执行功能检测！在连接 PTC 传感器之前，检查电阻器。**使用电阻表测量温度传感器的电阻器。PTC 传感器的耐低温性介于 60 至 300 欧姆之间。

4.5.4 网络接口

变频器 ***Wilo-EFC***

准备控制电缆的网线，安装一同提供的 RJ45 插头。比如与 Ethernet 模块“MCA 122”上的网络插座相连。

4.5.5 数字输入端接口

在连接数字输入端时请注意以下方面：

→ 使用屏蔽电缆。
→ 在预调试时自动设定参数。在这一过程中预分配各个数字输入端。无法修改预分配！
→ 为确保可自由选择的输入端的正确功能，在 Digital Data Interface 中分配相应的功能。

危险
错误连接时有生命危险！
如果在爆炸性气体危险环境内使用水泵，请注意“潜在爆炸环境中的电气连接”章节！

注意
注意生产商说明书！
详细信息请阅读并遵守变频器的说明书。

变频器：***Wilo-EFC***
→ 输入电压：+24 VDC，端子 12 和 13
→ 参考电势 (0 V)：端子 20

端子	功能	触点类型
18	开始	常开触点 (NO)
27	External Off	常闭触点 (NC)
37	Safe Torque Off (STO)	常闭触点 (NC)
19、29、32	可自由选择	

预分配的输入端的功能说明：
→ 开始
上级控制装置的接通/断开信号。**注意！ 如果不需要该输入端，在端子 12 和 18 之间安装短接！**
→ External Off
通过单独的开关远程关闭。**注意！ 输入端直接接通变频器！**
→ Safe Torque Off (STO) – 安全关闭 **注意！ 如果不需要该输入端，在端子 12 和 27 之间安装短接！**
在硬件方面通过变频器关闭水泵，不依赖于水泵控制器。不会自动重启（重启锁定功能）。**注意！ 如果不需要该输入端，在端子 12 和 37 之间安装短接！**

可以为 Digital Data Interface 中的自由输入端分配以下功能：
→ High Water
高水位警报信号。
→ Dry Run
干转保护信号。
→ Leakage Warn
外部密封室监控信号。在出现故障时输出一条故障信息。
→ Leakage Alarm
外部密封室监控信号。在出现故障时关闭水泵。可通过警报类型在配置中设置其他状态。
→ Reset
用于重置故障信息的外部信号。
→ High Clogg Limit
激活更高的堵塞识别公差（“Power Limit – High”）。

相应功能的触点类型

功能	触点类型
High Water	常开触点 (NO)
Dry Run	常闭触点 (NC)
Leakage Warn	常开触点 (NO)
Leakage Alarm	常开触点 (NO)
Reset	常开触点 (NO)
High Clogg Limit	常开触点 (NO)

4.5.6 模拟输入端接口

在连接模拟输入端时请注意以下方面：

→ 使用屏蔽电缆。
→ 可以为模拟输入端自由选择相应的功能。在 Digital Data Interface 中分配相应的功能！

注意
注意生产商说明书！
详细信息请阅读并遵守变频器的说明书。

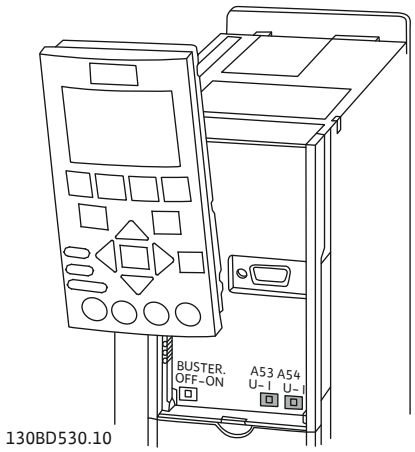


Fig. 9: 开关 A53 和 A54 的位置

变频器 *Wilo-EFC*
→ 电源电压：10 VDC、15 mA 或 24 VDC、200 mA
→ 端子：53、54
准备的接口与所使用的传感器类型有关。**小心！为正确连接，请遵守生产商说明书！**
→ 测量范围：0...20 mA、4...20 mA 或 0...10 V。
另外通过变频器上的两个开关设置信号类型（电压 (U) 或电流 (I)）。两个开关（A53 和 A54）位于变频器显示屏下方。**注意！也可以在 Digital Data Interface 中设置测量范围！**

可以在 Digital Data Interface 中分配以下功能：
→ External Control Value
通过上级控制装置作为模拟信号规定控制水泵转速的额定值。
→ Level
探测当前液位，以探测数据。数字输出端上“上升”和“下降”电平功能的基础。
→ Pressure
探测当前系统压力，以探测数据。
→ Flow
探测当前流量，以探测数据。

4.5.7 继电器输出端接口

在连接继电器输出端时请注意以下方面：
→ 使用屏蔽电缆。
→ 可以为继电器输出端自由选择相应的功能。在 Digital Data Interface 中分配相应的功能！

注意
注意生产商说明书！
详细信息请阅读并遵守变频器的说明书。

变频器 *Wilo-EFC*
→ 2x C 形继电器输出端。**注意！为准确定位继电器输出端，注意生产商说明书！**
→ 开关容量：240 VAC，2 A
在继电器输出端 2 的常开触点（端子：4/5）上可能有更高的开关容量：最高 400 VAC，2 A

端子	触点类型
继电器输出端 1	
1	中温接口 (COM)
2	常开触点 (NO)
3	常闭触点 (NC)
继电器输出端 2	
4	中温接口 (COM)
5	常开触点 (NO)
6	常闭触点 (NC)

可以在 Digital Data Interface 中分配以下功能：
→ Run
水泵的单泵运行信号
→ Rising Level

上升电平下的信息。

→ Falling Level
下降电平下的信息。

→ Warning
水泵的单泵故障信号：警告。

→ Error
水泵的单泵故障信号：警报。

→ Cleaning
水泵的清洁序列开始时的信号。

4.5.8 模拟输出端接口

在连接模拟输出端时注意以下方面：
→ 使用屏蔽电缆。
→ 可以为输出端自由选择相应的功能。在 Digital Data Interface 中分配相应的功能！

注意
注意生产商说明书！
详细信息请阅读并遵守变频器的说明书。

变频器 ***Wilo-EFC***
→ 端子：39/42
→ 测量范围：0...20 mA 或 4...20 mA
注意！ 也可以在 Digital Data Interface 中设置测量范围！

可以在 Digital Data Interface 中分配以下功能：
→ Frequency
显示当前实际频率。

→ Level
显示当前液位。**注意！ 在显示时，必须在一个输入端上连接相应的信号变送器！**

→ Pressure
显示当前工作压力。**注意！ 在显示时，必须在一个输入端上连接相应的信号变送器！**

→ Flow
显示当前流量。**注意！ 在显示时，必须在一个输入端上连接相应的信号变送器！**

4.5.9 输入/输出端扩展接口（LPI 模式）

注意
注意阅读详细文档！
此外还应阅读生产商说明并遵守其中列举的各项要求，以便按规定使用产品。

	Wilo IO 1	Wilo IO 2
概述		
型号	ET-7060	ET-7002
电源连接	10...30 VDC	10...30 VDC
运行温度	-25...+75 °C	-25...+75 °C
尺寸（宽 x 长 x 高）	72 x 123 x 35 mm	72 x 123 x 35 mm
数字输入端		
数量	6	6
电平“开”	10...50 VDC	10...50 VDC
电平“关”	最大 4 VDC	最大 4 VDC
继电器输出端		

	Wilo IO 1	Wilo IO 2
数量	6	3
触点类型	常开触点 (NO)	常开触点 (NO)
开关容量	5 A，250 VAC/24 VDC	5 A，250 VAC/24 VDC
模拟输入端		
数量	–	3
可选择测量范围	–	是，有跳线
可能的测量范围	–	0...10 V，0...20 mA，4...20 mA

所有其他技术数据请参考生产商说明书。

安装

注意！ 所有有关修改 IP 地址和安装的信息请参考生产商说明书！

1. 设置测量范围的信号类型（电流或电压）：放置跳线。
   注意！ 在 Digital Data Interface 中设置测量范围，向 I/O 模块传输。未在 I/O 模块中设置测量范围。
2. 将模块固定在控制柜中。
3. 连接输入和输出端。
4. 连接电源连接。
5. 设置 IP 地址。
6. 在 Digital Data Interface 中设置所使用 I/O 模块的型号。

***I/O* 模块概述**

端子 1...7	数字输入端
端子 8	电源连接 (+)
端子 9	电源连接 (-)
端子 12...23	继电器输出端，常开触点 (NO)

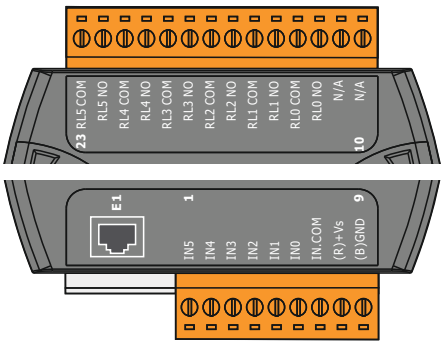


Fig. 10: Wilo IO 1 (ET-7060)

端子 1...6	模拟输入端
端子 8	电源连接 (+)
端子 9	电源连接 (-)
端子 10...15	继电器输出端，常开触点 (NO)
端子 16...23	数字输入端

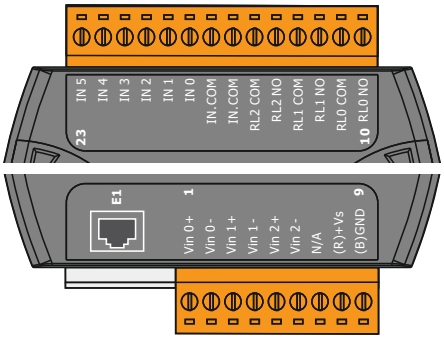


Fig. 11: Wilo IO 2 (ET-7002)

输入端和输出端的功能

可以为输入和输出端分配与变频器上相同的功能。**注意！ 在 Digital Data Interface 中分配连接的输入和输出端！** (“Settings ➔ I/O Extension”)

4.6 系统模式 LSI

在“LSI”系统模式下，通过 Digital Data Interface 完全控制泵站。一个系统至少包含以下产品：

→ 最多 4 个水泵，每个水泵均带有 Digital Data Interface 和自己的变频器
→ 1 个 I/O2 模块
→ 1 个适用于额定值规定参数的液位传感器

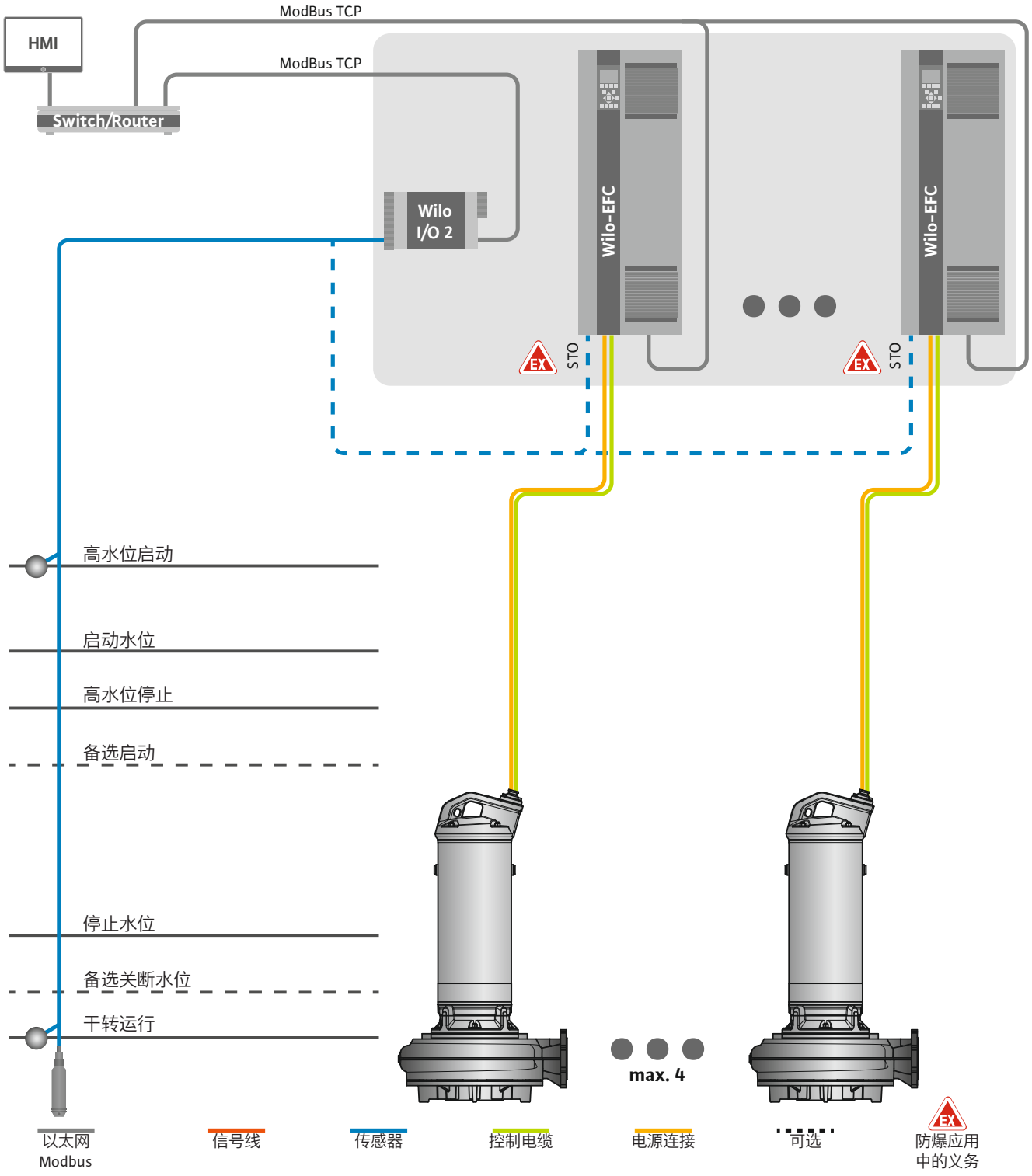


Fig. 12: LSI 系统模式接口：系统概览

泵站独立工作，不需要上级控制系统。在输出端上或通过现场总线可以使用各种功能，以限制与上级控制系统的交互：

→ 系统释放
→ 故障和警告信号
→ 测量值传输

小心！ 上级控制系统在定义通道外进行干预会导致系统功能故障！

传感器和控制触发器的跨系统参数集中连接在 I/O 模块上。通过 Digital Data Interface 分配对应的功能。

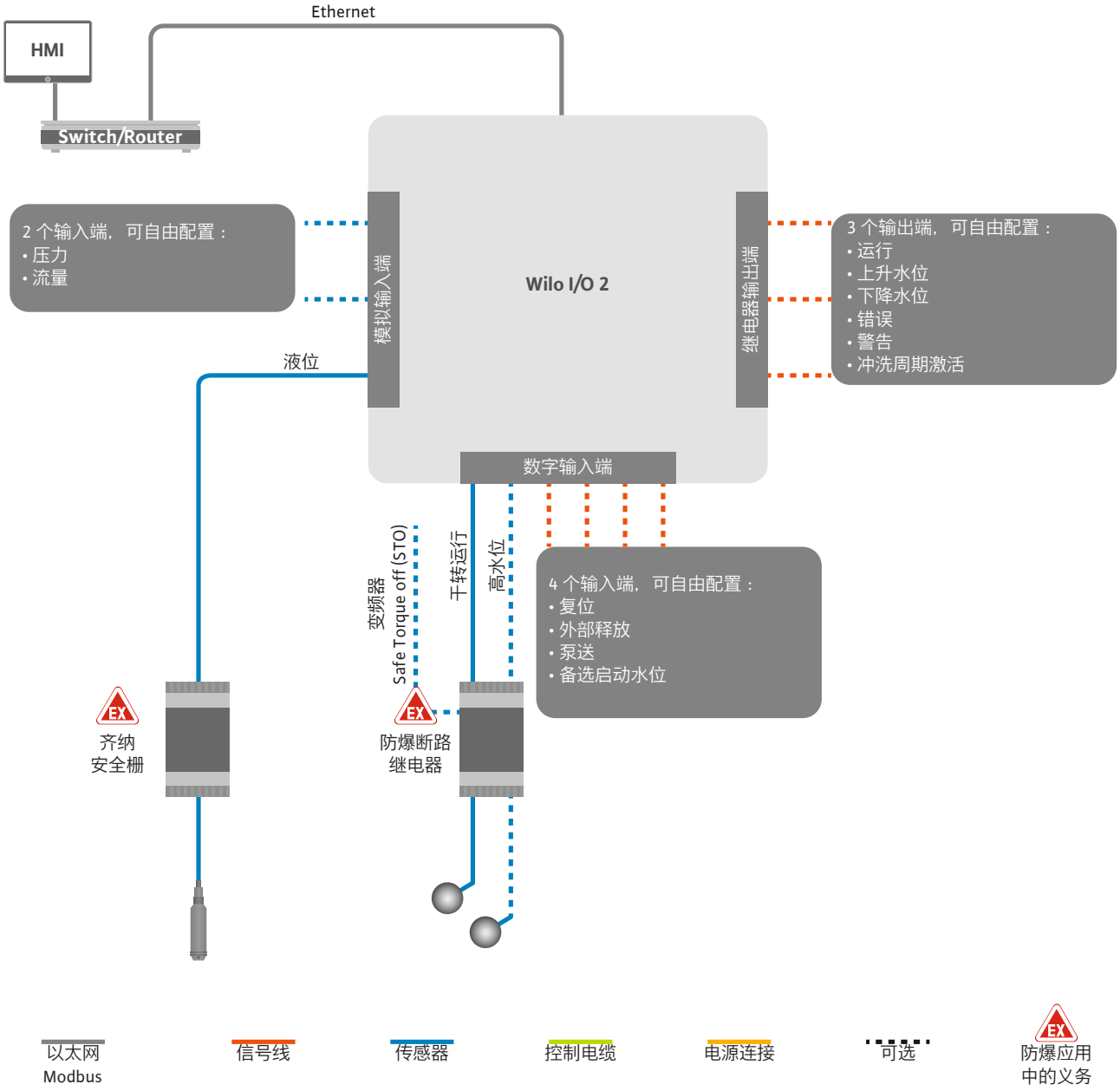


Fig. 13: LSI 系统模式接口：I/O2 模块

通过变频器记录单头泵的泵参数（运行和故障信息）。还可以通过变频器输出当前测量值。通过 Digital Data Interface 分配功能。

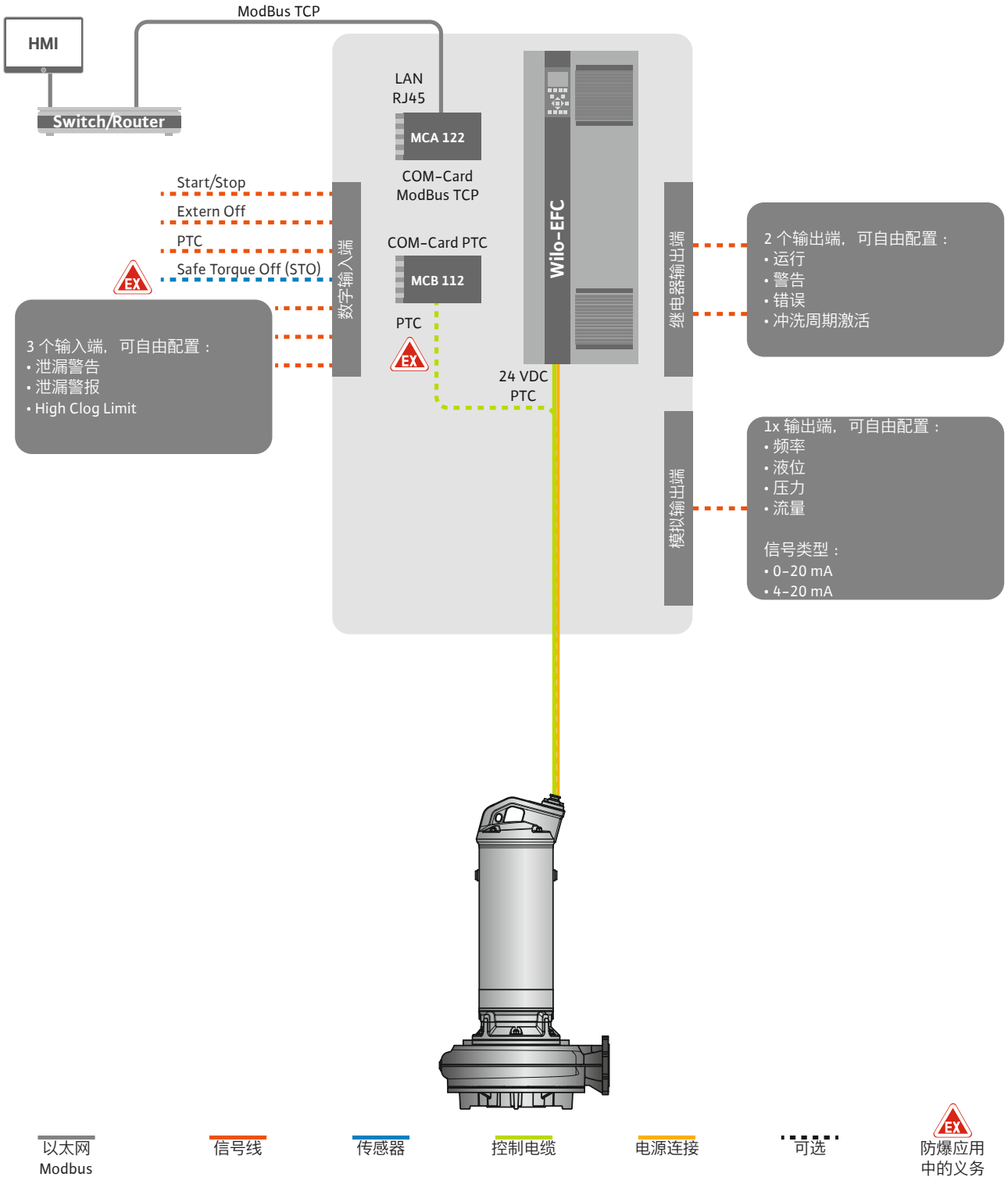


Fig. 14: LSI 系统模式接口：变频器

小心！ 始终占用数字输入端**“Start/Stop”**、**“Extern off”**和**“Safe Torque Off”**。如果不需要该输入端，则安装短接！

4.6.1 调控模式

单个水泵按照 Master/Slave 原理工作。通过 Slave 首页分别设置各个水泵。通过上一级 Master 首页设置与设备相关的参数：

→ Operating Mode – 接通和关闭系统，设定调控模式。
→ System Limits – 设定系统限值。
→ 调控模式的基本设置：
  – Level Controller
  – PID
  – High Efficiency(HE) Controller

系统中的所有水泵都通过所设置的参数进行控制。主泵在系统中是冗余的。如果当前主泵出现故障，则主功能将转移至另一个水泵上。

4.6.1.1 调控模式：Level Controller

最多可以定义 6 个切换水位。为每个切换水位设置水泵数量和所需的运行频率。

4.6.1.2 调控模式：PID Controller

使用 PID 控制时，额定值可以参考系统中的恒定流量、液位或压力关联。所有已接通水泵的调控输出频率均相同。根据额定值偏差和输出频率，在一段时间延迟后接通或关闭水泵。

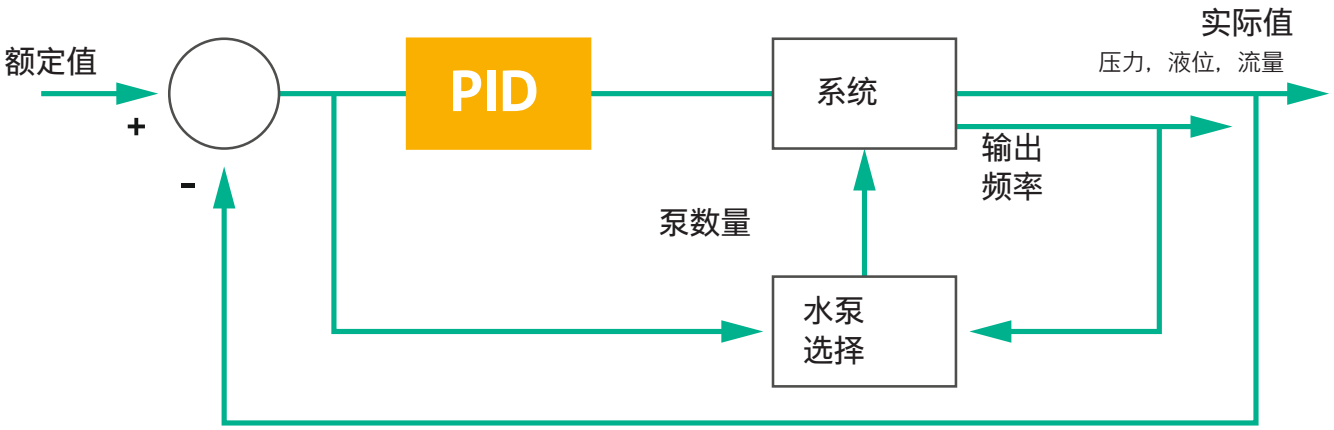


Fig. 15: 带 PID 控制器的控制回路

注意！ 系统中必须始终装有液位传感器以进行 PID 控制。还需配备相应的传感器，以进行针对压力或流量采集的额定值设定！

PID 控制器包括三个部分：
→ 比例
→ 积分
→ 微分。

“FMIN/FMAX”指系统限值中 Min/Max Frequency 的数据。

调控条件

如果两个条件在定义的时间段内适用，则接通水泵：
→ 额定值偏差超出定义的限值。
→ 输出频率达到**最高**频率。

如果两个条件在定义的时间段内适用，则关闭水泵：
→ 额定值偏差超出定义的限值。
→ 输出频率达到**最低**频率。

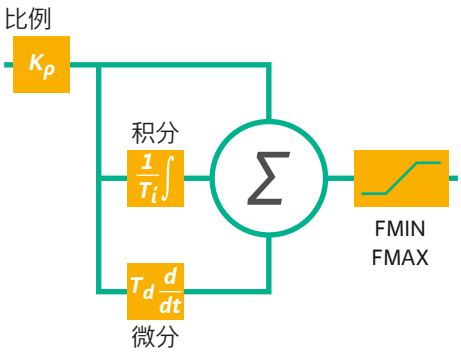


Fig. 16: PID 控制器

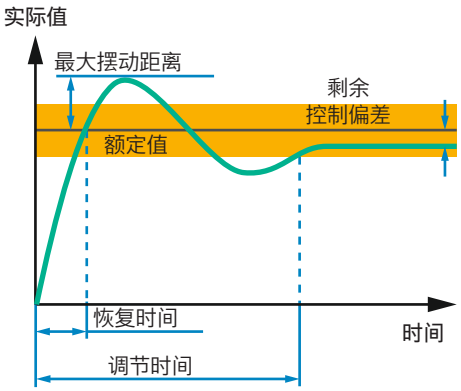


Fig. 17: 控制回路的阶跃响应

下图对调控功能进行了说明。下表清楚地说明了各个部分的相关性。

控制回路的阶跃响应	恢复时间	最大摆动距离	调节时间	剩余控制偏差
比例	Decrease	Increase	Small change	Decrease
积分	Decrease	Increase	Increase	Eliminate
微分	Small change	Decrease	Decrease	Small change

表 *1:* 比例、积分和微分部分对控制回路阶跃响应的影响

4.6.1.3 调控模式：High Efficiency(HE) Controller

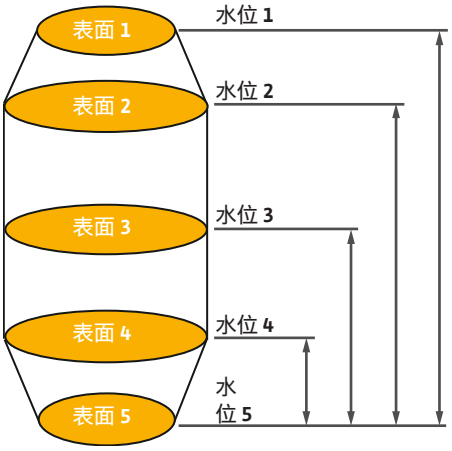


Fig. 18: HE 控制器：集水坑几何形状展示

通过 HE 控制器实现对转速可调节的污水泵的节能控制。通过水位测量可以连续计算工作频率，然后将其传输给变频器。计算工作频率时始终将系统的边界条件考虑在内：

→ 调节参数
→ 管路参数
→ 集水坑几何形状

HE 控制器仅控制一个激活的水泵。系统中的所有其他水泵均被当作备用水泵。进行水泵更换时，将所有现有水泵考虑在内。

持续监控系统曲线，以确保运行可靠。如果系统曲线与额定状态的偏差过大，则需采取应对措施。

注意！ 计算系统曲线需要在不同频率下进行流量测量。如果泵站没有流量测量设备，则计算输送流量。

如何激活 *HE* 控制器？

在 Digital Data Interface 中设置以下参数，以激活 HE 控制器：

1. 设置调节参数。
2. 设置管路参数。
3. 计算管路。计算持续约 1 – 3 分钟。
4. 保存集水坑几何形状。

► 随着下一次水泵启动自动开始系统曲线测定。
► 有关设置的更多信息请参见“LSI 系统模式的扩展预调试”一章。

系统曲线测定

测定时最好使用 4 个频率。它们是最低频率和额定频率之间的等距频率。每个频率使用 2 次，持续 3 分钟。每天进行一次测定，以确保系统曲线始终为最新状态。测量期间的特点：

→ 如果输入量过高，则应选择下一个相应更高的频率。由此可以确保对输入量进行正确处理。
→ 达到停止水位时，在下一个泵送过程中继续进行测定。

最佳频率下的水泵运行

在测定系统曲线后计算出能效最佳的频率，即每立方米泵送功耗最低的工作频率。将该工作频率用于下一个泵送过程。如果输入量大于流量，则控制系统将进行干预：

→ 提高工作频率，直到流量稍小于输入量。这时可以缓慢填充集水坑，直至达到启动水位。
→ 当达到启动水位时，流量与输入量相等。这样，集水坑中的水位可以保持恒定。
→ 此时，根据液位进行控制：

– 如果液位下降，水泵重新以计算出的工作频率运行。从集水坑中抽水，直至达到停止水位。
– 如果液位超过启动水位，则水泵以额定频率运行。从集水坑中抽水，直至达到停止水位。计算出的工作频率将仅在下一个泵出过程中再次使用！

沉积

在泵送过程中还会监控管路直径。如果管路直径因沉积物而变窄（沉积），则以额定频率启动冲洗。达到设置的极值时结束冲洗。

4.6.2 与系统有关的框架参数

各种与系统有关的框架参数存储在系统限值中：
→ 启动和停止水位的高水位
→ 干转保护的水位
→ **备选接通水位**
“备选接通水位”是另一个接通水位，用于提前对集水坑进行泵送。这种先行式的接通水位可以提高特殊情况下集水坑的储备体积容量，例如暴雨时。在 I/O 模块上安装一个触发器，以激活备选的接通水位。
→ **备选关断水位**
“备选关断水位”是另一个关断水位，用于降低集水坑中的液位或为液位传感器通风。在达到设定的泵送循环数量后自动激活备选关断水位。水位值必须处在关断水位和干转保护水位之间。
→ 最低和最高工作频率
→ 干转运行传感器源
→ ...

4.6.3 水泵电源连接

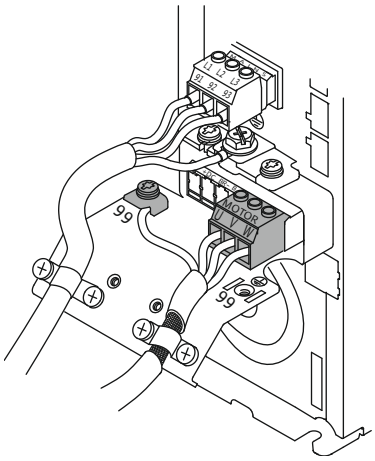


Fig. 19: 水泵接口：Wilo-EFC

变频器 *Wilo-EFC*

端子	芯线名称
96	U
97	V
98	W
99	接地 (PE)

将电机接线电缆穿过电缆螺纹接头引入变频器中并进行固定。按照接线图连接芯线。

注意！ 大面积地放置电缆屏蔽层！

4.6.4 电机绕组中的 PTC 传感器接口

变频器 *Wilo-EFC*

危险
错误连接时有生命危险！
如果在爆炸性气体危险环境内使用水泵，请注意“潜在爆炸环境中的电气连接”章节！

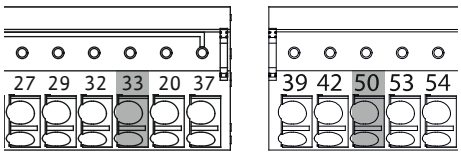


Fig. 20: 端子 Wilo-EFC

端子	控制电缆芯线	说明
50	3	+10 VDC 电源
33	4	数字输入端：PTC/WSK

通过电机绕组中的 Pt100 或 Pt1000 传感器在软件方面进行电机过热保护。可通过用户界面查看和设置当前温度值和极限温度。硬件方面安装的 PTC 传感器定义最高绕组温度，在紧急情况下关闭电机。

小心！ 执行功能检测！在连接 PTC 传感器之前，检查电阻器。使用电阻表测量温度传感器的电阻器。PTC 传感器的耐低温性介于 60 至 300 欧姆之间。

4.6.5 网络接口

变频器 *Wilo-EFC*

准备控制电缆的网线，安装一同提供的 RJ45 插头。比如与 Ethernet 模块“MCA 122”上的网络插座相连。

4.6.6 数字输入端接口

在连接数字输入端时请注意以下方面：
- → 使用屏蔽电缆。
- → 在预调试时自动设定参数。在这一过程中预分配各个数字输入端。无法修改预分配！
- → 为确保可自由选择的输入端的正确功能，在 Digital Data Interface 中分配相应的功能。

危险

错误连接时有生命危险！

如果在爆炸性气体危险环境内使用水泵，请注意“潜在爆炸环境中的电气连接”章节！

注意

注意生产商说明书！

详细信息请阅读并遵守变频器的说明书。

变频器：*Wilo-EFC*
- → 输入电压：+24 VDC，端子 12 和 13
- → 参考电势 (0 V)：端子 20

端子	功能	触点类型
18	开始	常开触点 (NO)
27	External Off	常闭触点 (NC)
37	Safe Torque Off (STO)	常闭触点 (NC)
19、29、32	可自由选择	

预分配的输入端的功能说明：
- → 开始
  在 LSI 系统模式下不需要。**在端子 12 和 18 之间安装短接！**
- → External Off
  在 LSI 系统模式下不需要。**在端子 12 和 27 之间安装短接！**
- → Safe Torque Off (STO) – 安全关闭
  在硬件方面通过变频器关闭水泵，不依赖于水泵控制器。不会自动重启（重启锁定功能）。**注意！ 如果不需要该输入端，在端子 12 和 37 之间安装短接！**

可以为 Digital Data Interface 中的自由输入端分配以下功能：
- → Leakage Warn
  外部密封室监控信号。在出现故障时输出一条故障信息。
- → Leakage Alarm
  外部密封室监控信号。在出现故障时关闭水泵。可通过警报类型在配置中设置其他状态。
- → High Clogg Limit
  激活更高的堵塞识别公差（“Power Limit – High”）。

“High Water”、“Dry Run”和“Reset”功能连接在 I/O 模块上并在 Digital Data Interface 中进行分配！

相应功能的触点类型

功能	触点类型
Leakage Warn	常开触点 (NO)
Leakage Alarm	常开触点 (NO)
High Clogg Limit	常开触点 (NO)

4.6.7 继电器输出端接口

在连接继电器输出端时请注意以下方面：
→ 使用屏蔽电缆。
→ 可以为继电器输出端自由选择相应的功能。在 Digital Data Interface 中分配相应的功能！

注意
注意生产商说明书！
详细信息请阅读并遵守变频器的说明书。

变频器 ***Wilo-EFC***
→ 2x C 形继电器输出端。**注意！为准确定位继电器输出端，注意生产商说明书！**
→ 开关容量：240 VAC，2 A
在继电器输出端 2 的常开触点（端子：4/5）上可能有更高的开关容量：最高 400 VAC，2 A

端子	触点类型
继电器输出端 1	
1	中温接口 (COM)
2	常开触点 (NO)
3	常闭触点 (NC)
继电器输出端 2	
4	中温接口 (COM)
5	常开触点 (NO)
6	常闭触点 (NC)

可以在 Digital Data Interface 中分配以下功能：
→ Run
水泵的单泵运行信号
→ Error
水泵的单泵故障信号：警报。
→ Warning
水泵的单泵故障信号：警告。
→ Cleaning
水泵的清洁序列开始时的信号。

“Rising Level”和“Falling Level”功能连接在 I/O 模块上并在 Digital Data Interface 中进行分配！

4.6.8 模拟输出端接口

在连接模拟输出端时注意以下方面：
→ 使用屏蔽电缆。
→ 可以为输出端自由选择相应的功能。在 Digital Data Interface 中分配相应的功能！

注意
注意生产商说明书！
详细信息请阅读并遵守变频器的说明书。

变频器 ***Wilo-EFC***
→ 端子：39/42
→ 测量范围：0...20 mA 或 4...20 mA
注意！也可以在 Digital Data Interface 中设置测量范围！

可以在 Digital Data Interface 中分配以下功能：
→ Frequency
显示当前实际频率。
→ Level
显示当前液位。**注意！在显示时，必须在一个输入端上连接相应的信号变送器！**

→ Pressure
显示当前工作压力。注意！ 在显示时，必须在一个输入端上连接相应的信号变送器！

→ Flow
显示当前流量。注意！ 在显示时，必须在一个输入端上连接相应的信号变送器！

4.6.9 输入/输出端扩展接口（LSI 模式）

注意

注意阅读详细文档！

此外还应阅读生产商说明并遵守其中列举的各项要求，以便按规定使用产品。

	Wilo IO 2
概述	
型号	ET-7002
电源连接	10...30 VDC
运行温度	-25...+75 °C
尺寸（宽 x 长 x 高）	72 x 123 x 35 mm
数字输入端	
数量	6
电平“开”	10...50 VDC
电平“关”	最大 4 VDC
继电器输出端	
数量	3
触点类型	常开触点 (NO)
开关容量	5 A，250 VAC/24 VDC
模拟输入端	
数量	3
可选择测量范围	是，有跳线
可能的测量范围	0...10 V，0...20 mA，4...20 mA

所有其他技术数据请参考生产商说明书。

安装

注意！ 所有有关修改 IP 地址和安装的信息请参考生产商说明书！

1. 设置测量范围的信号类型（电流或电压）：放置跳线。
   注意！ 在 Digital Data Interface 中设置测量范围，向 I/O 模块传输。未在 I/O 模块中设置测量范围。
2. 将模块固定在控制柜中。
3. 连接输入和输出端。
4. 连接电源连接。
5. 设置 IP 地址。
6. 在 Digital Data Interface 中设置所使用 I/O 模块的型号。

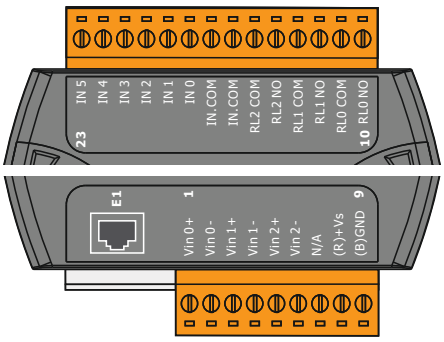


Fig. 21: Wilo IO 2 (ET-7002)

I/O 2 模块概述

端子 1...6	模拟输入端
端子 8	电源连接 (+)
端子 9	电源连接 (-)
端子 10...15	继电器输出端，常开触点 (NO)
端子 16...23	数字输入端

输入和输出

注意！ 在主泵的 Digital Data Interface 中分配所连接的输入和输出端！ (“Settings ➔ I/O Extension”)

以下功能可以分配给**数字**输入端：

→ High Water
高水位警报信号。

→ Dry Run
干转保护信号。

→ Reset
用于重置故障信息的外部信号。

→ System Off
外部信号，用于关闭系统。

→ Trigger Start Level
启动泵出过程。从集水坑中抽水，直至达到关闭水位。

→ Alternative Start Level
激活备选接通水位。

以下功能可以分配给**模拟**输入端：

注意！ 将“液位”功能分配给液位传感器的模拟输入端！

→ External Control Value
源自上级控制器的额定值规定，用于将泵站作为模拟信号进行控制。**注意！ 在 LSI 系统模式下，泵站独立于上级控制系统进行工作。如须由上级控制系统规定额定值，请咨询客户服务部！**

→ Level
在 LSI 系统模式下为调控模式规定额定值。
注意！ LSI 系统模式的前提条件！为输入端分配此功能。

→ Pressure
探测当前系统压力，以探测数据。
注意！ 可作为调节值用于 PID 控制器！

→ Flow
探测当前流量，以探测数据。
注意！ 可作为调节值用于 PID 和 HE 控制器！

以下功能可以分配给**继电器输出端**：

→ Run
集中运行信号

→ Rising Level
上升电平下的信息。

→ Falling Level
下降电平下的信息。

→ System Error
集中故障信号：错误。

→ System Warning
集中故障信号：警告。

→ Cleaning

水泵的清洁序列激活时的信号。

4.7 潜在爆炸环境中的电气连接

危险

错误连接时有生命危险！

如果水泵安装在潜在爆炸环境中，则连接“Safe Torque Off”上的干转保护和电机过热保护！

- 注意变频器的说明书！
- 注意本章中的所有信息！

如果在潜在爆炸环境内安装水泵，注意以下几点：

信号变送器

→ 安装单独的干转保护信号变送器。
→ 通过防爆切断继电器连接浮子开关。
→ 通过齐纳安全栅连接液位传感器。

变频器 *Wilo-EFC*

→ 安装 PTC 热敏电阻卡“MCB 112”。
注意变频器和 PTC 热敏电阻卡的说明书！

LSI 系统模式：每台变频器安装一张卡！

→ 将 PTC 传感器连接在 PTC 热敏电阻卡“MCB 112”上：
端子 T1 和 T2

→ 将 PTC 热敏电阻卡“MCB 112”连接在“Safe Torque Off (STO)”上：
– 将 PTC 热敏电阻卡“MCB 112”端子 10 连接在变频器的端子 33 上。
– 将 PTC 热敏电阻卡“MCB 112”端子 12 连接在变频器的端子 37 上。

→ 将干转保护额外连接在 PTC 热敏电阻卡“MCB 112”上。
端子 3 至 9

危险！ LSI 系统模式：连接所有变频器上的干转保护！

5 操作

注意

断电后自动接通

通过单独的控制器根据流程接通和断开产品。在停电之后，可自动接通产品。

5.1 系统要求

在配置和试运行水泵时需要以下组件：

→ 安装 Windows、Macintosh 或 Linux 操作系统的电脑配备有 Ethernet 接口
→ 用于访问用户界面的网络浏览器。支持下列网络浏览器：
– Firefox 65 或以上版本
– Google Chrome 60 或以上版本
– 其他网络浏览器可能在页面显示方面有限制！
→ Ethernet 网络：10BASE-T/100BASE-TX

5.2 用户账号

Digital Data Interface 有两个用户帐号：

→ Anonymous user
无密码的默认帐号用于显示设置。无法修改设置。

→ Regular user
有密码的用户帐号用于配置设置。
– 用户名：user
– 密码：user
通过侧边栏菜单登录。在 2 分钟之后，用户自动退出。

注意！ 为确保安全，在首次配置时请修改出厂密码！

注意！ 如果新密码丢失，请通知客户服务部！客户服务部可以恢复出厂密码。

5.3 操作元件

Fig. 22: 展开菜单

展开菜单

若要显示一个菜单项，点击它。始终只显示一个菜单。如果点击一个菜单项，则会关闭展开的菜单项。

Fig. 23: 通/断开关

通/断开关

为打开或关闭功能，点击开关：
→ “灰色”开关：功能已关闭。
→ “绿色”开关：功能已打开。

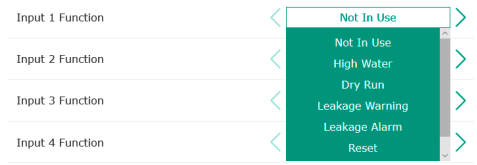


Fig. 24: 选择框

选择框

可以以两种方式在选择框中进行选择：
→ 通过左右侧的两个箭头可以连续点击数值。
→ 通过点击该框出现数值列表。点击所需的数值。

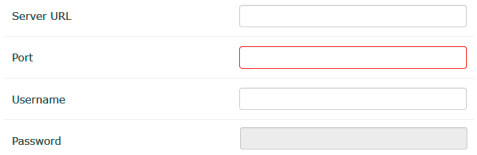


Fig. 25: 文本框

文本框

在文本框中可以直接输入相应的值。文本框的显示与输入内容有关：
→ 白色文本框
可以输入或修改相应的值。
→ 有红框的白色文本框
必填栏！必须输入相应的值。
→ 灰色文本框
已禁用文本输入。自动插入数值，或者登录以修改数值。

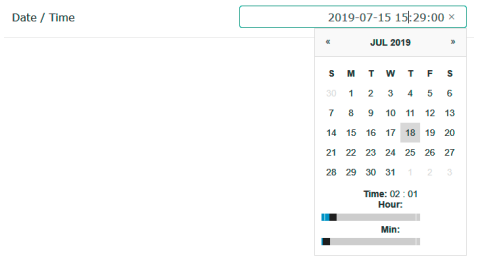


Fig. 26: 日期/时间

日期和时间

如果未通过 NTP 协议同步日期和时间，则通过选择框设置日期和时间。点击输入框设置日期和时间：
→ 在日历中选择并点击日期。
→ 通过滑块设置时间。

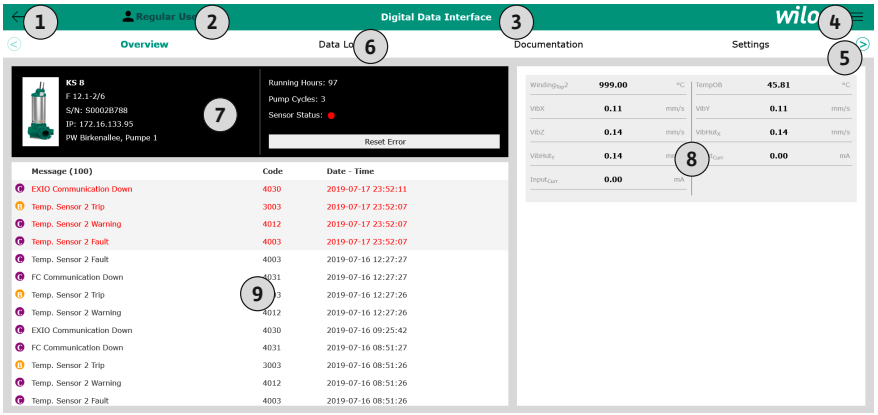
5.4 应用输入内容/修改内容

不会自动将所有输入内容和修改内容应用到相应的菜单中：
→ 在相应菜单中点击“Save”，以应用输入内容和修改内容。
→ 选择其他菜单，或者切换为首页，以丢弃输入内容或修改内容。

5.5 首页

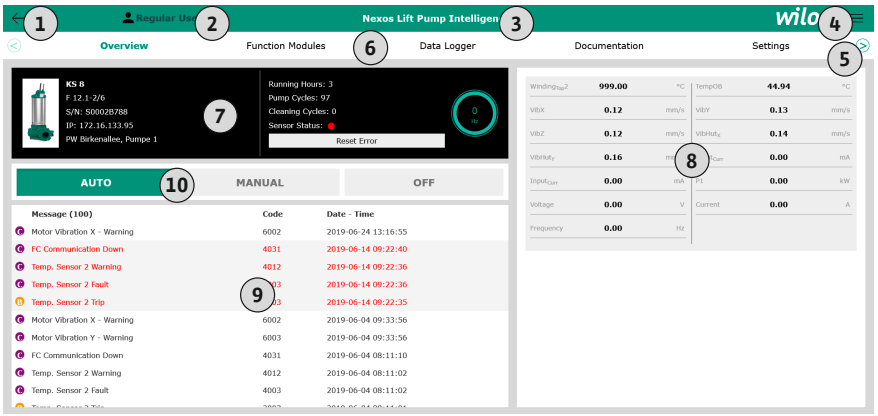
通过用户图形界面，借助网络浏览器访问以及控制 Digital Data Interface。在输入 IP 地址之后，显示首页。在首页上可快速、清楚地显示有关水泵或泵站的所有重要信息。另外这样可以访问主菜单以及用户登录。首页上的显示与所选系统模式不同。

5.5.1 首页：系统模式 DDI



1	返回
2	登录的用户
3	软件许可证/系统模式
4	侧边栏菜单
5	翻页主菜单
6	主菜单
7	水泵数据
8	传感器值
9	故障协议

5.5.2 首页：系统模式 LPI



1	返回
2	登录的用户
3	软件许可证/系统模式
4	侧边栏菜单
5	翻页主菜单
6	主菜单
7	水泵数据
8	传感器值
9	故障协议
10	水泵的运行模式

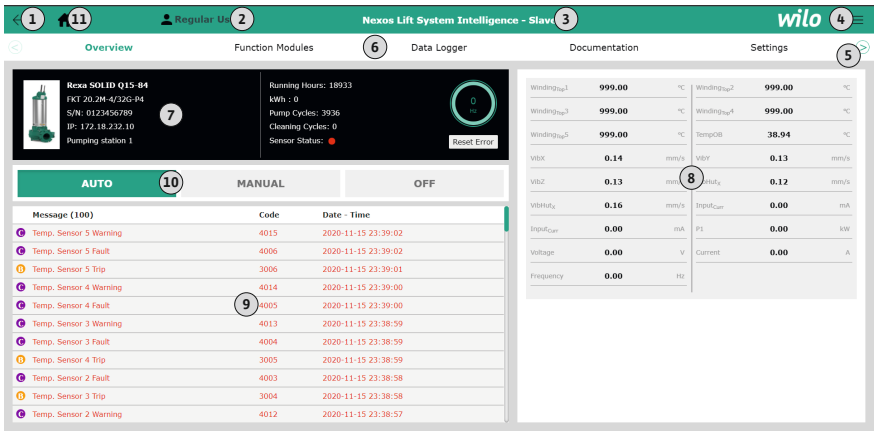
5.5.3 首页：系统模式 LSI

在 LSI 系统模式下有两个不同的首页：

→ Slave 首页
每个水泵都有自己的首页。通过该首页可以查看当前的水泵运行数据。还可以通过该首页配置水泵。

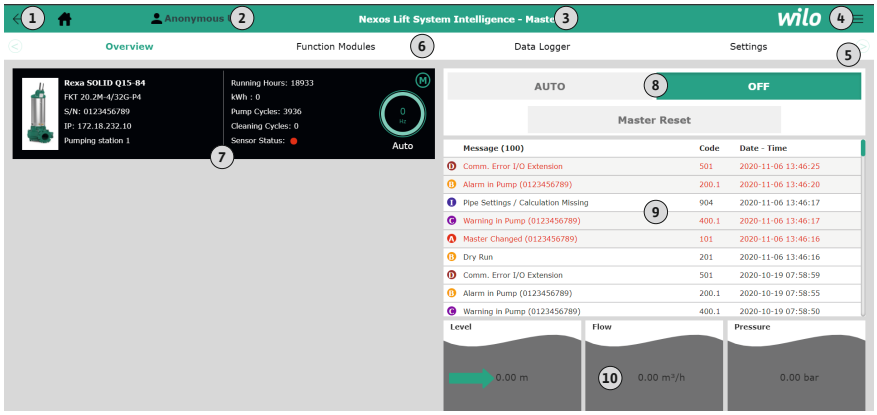
→ Master 首页
系统有一个上级 Master 首页。在此处显示泵站和单个水泵的运行参数。还可以通过该首页设置泵站的调节参数。

Slave 首页



1	返回
2	登录的用户
3	软件许可证/系统模式
4	侧边栏菜单
5	翻页主菜单
6	主菜单
7	水泵数据
8	传感器值
9	水泵的故障日志
10	水泵的运行模式
11	切换至 Master 首页。

Master 首页



1	返回
2	登录的用户
3	软件许可证/系统模式
4	侧边栏菜单
5	翻页主菜单
6	主菜单
7	显示系统中现有的水泵及水泵数据
8	系统的运行模式
9	系统的故障日志
10	泵站的运行数据

5.5.4 水泵数据

根据设置的系统模式显示以下水泵数据：

水泵数据	系统模式			
	DDI	LPI	LSI 主机	LSI 备用水泵
水泵类型	•	•	•	•
电机类型	•	•	•	•
IP 地址	•	•	•	•
安装名称	•	•	•	•
运行小时数	•	•	•	•
泵送循环	•	•	•	•
清洁循环	–	•	•	•
传感器状态	•	•	•	•
工作频率	–	•	•	•
水泵的运行模式	–	•	•	•

图例
– = 不可用，• = 可用

5.5.5 传感器值

根据设置的系统模式和电机配置，可显示以下传感器：

说明	显示屏	系统模式		
		DDI	LPI	LSI 备用水泵
绕组温度 1	Winding 1	•	•	•
绕组温度 2	Winding 2	o	o	o
绕组温度 3	Winding 3	o	o	o
上方存储温度	Bearing 4	o	o	o
下方存储温度	Bearing 5	o	o	o
Digital Data Interface 温度传感器	TempOB	•	•	•
Digital Data Interface 振动传感器	VibX, VibY, VibZ	•	•	•
电机轴承振动传感器	MotX, MotY	o	o	o
密封室泄漏	L.SC	o	o	o
泄漏腔泄漏	L.LC	o	o	o
功耗	P1	–	•	•
额定电压	Voltage	–	•	•
额定电流	Current	–	•	•
频率	Frequency	–	•	•

图例
– = 不可用，o = 可选，• = 可用

注意！ 只显示同样安装了的传感器。显示内容根据电机配置变化。

5.5.6 水泵的运行模式

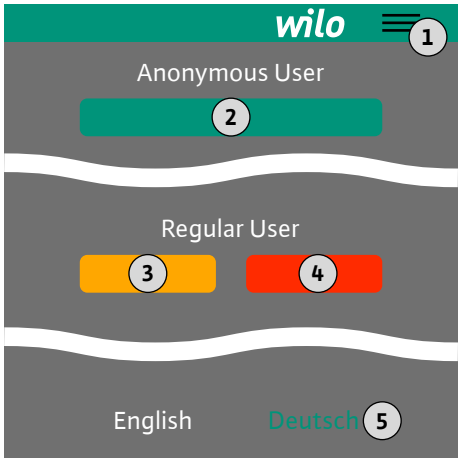
在“LPI”和“LSI”系统模式中，可直接通过首页控制水泵：

→ Off
水泵关闭。

→ Manual
手动打开水泵。在点击按键“Off”或达到关闭液位前，水泵一直运行。
注意！ 在手动运行时，输入工况点的频率！（参见菜单：“Function Modules ➜ Operating Mode ➜ Frequency in Manual Mode”）
注意！ “LSI”系统模式：只有当“关闭”主运行模式时，才能手动运行！

→ Auto
自动运行水泵。
“LPI”系统模式：通过上级控制装置规定额定值。
“LSI”系统模式：通过系统主机规定额定值。

5.6 侧边栏菜单



1	显示/隐藏侧边栏菜单
2	“Login”（绿色按键）
3	“Edit profile”（黄色按键）
4	“Logout”（红色按键）
5	选择菜单语言 - 以绿色显示当前语言。

点击层叠图标显示和隐藏侧边栏菜单。通过侧边栏菜单访问以下功能：
→ 用户管理
  – 显示当前登录的用户：Anonymous user或Regular user
  – 用户登录：点击“Login”。
  – 用户退出：点击“Logout”。
  – 修改用户密码：点击“Edit profile”。
→ 菜单语言
  点击所需的语言。

6 配置

6.1 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。
→ 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。
→ 已接通整套设备的安全装置（含急停）并检查功能是否正常。

6.2 工作人员资格鉴定

操作人员在配置和运行水泵时必须满足以下前提条件：
→ 安全操作以网络为基础的英语用户界面
→ 以下领域的专业语言知识，尤其是英语
  – 电子技术，变频器专业领域
  – 水泵技术，水泵系统运行专业领域
  – 网络技术，网络组件的配置

6.3 前提条件

在配置 Digital Data Interface 时，必须满足下列前提条件：

前提条件	系统模式		
	DDI	LPI	LSI
网络			
Ethernet 网络：10BASE-T/100BASE-TX，以 IP 为基础，配备 DHCP 服务器*	•	•	•
变频器的 IP 地址 在出厂时由 DHCP 服务器*调用。在分配固定 IP 地址时，注意生产商说明书！	–	•	•
I/O 模块 IP 地址 I/O 模块有固定的 IP 地址。在修改该 IP 地址时，注意生产商说明书！	o	o	•
操作设备			
安装 Windows、Macintosh 或 Linux 操作系统的电脑配备有 Ethernet 接口并安装有网络浏览器**	•	•	•

图例
– = 不需要，o = 需要时，• = 必须有

***没有 DHCP 服务器的网络**
Digital Data Interface 在出厂时设置为 DHCP。这样可通过 DHCP 服务器调用所有所需的网络参数。在首次配置时，网络中必须有 DHCP 服务器。这样可以为无 DHCP 服务器运行而固定设置所需的 IP 地址。

****支持的网络浏览器**
支持以下网络浏览器：
→ Firefox 65 或以上版本
→ Google Chrome 60 或以上版本

6.4 首次配置

下文对不同的系统模式进行了逐步说明。逐步说明的前提条件：
→ 已完成所有必要的电气连接。
→ 已为每个部件定义了固定的 IP 地址。

→ 笔记本电脑或触摸面板可用于访问基于网络的用户界面 (Web-HMI)。

注意

为进行设置，用户登录！

用户通过侧边栏菜单登录：
- 用户名: user
- 密码: user

在首次配置时修改出厂密码！

6.4.1 首次配置：系统模式“DDI”

在开始预调试之前，为以下部件设置一个固定的 IP 地址：
→ 水泵
→ 笔记本电脑/触摸面板 (Web HMI)

配置水泵

1. 连接水泵和 DHCP 服务器。

   在首次配置时，网络中必须有 DHCP 服务器。Digital Data Interface 在出厂时设置为 DHCP。这样可通过 DHCP 服务器调用所有所需的网络参数。
2. 将水泵的 IP 地址和子网设置为已确定的网络配置。

   Settings ➔ Digital Data Interface ➔ Network Interface Settings Network Interface Settings [▶ 42]
3. 重新连接到所设置的 IP 地址上。
4. 用户帐号：“Regular user”：修改出厂密码。

   打开侧边栏菜单并更改用户资料。修改“Regular User”用户帐号的出厂密码 [▶ 41]
5. 设置时间/日期。

   为正确记录 Digital Data Interface 中的所有变更，请设置当前时间和日期。

   Settings ➔ Clock Clock [▶ 42]
6. 设置语言。

   Settings ➔ Menu Language Menu Language [▶ 42]

6.4.2 首次配置：系统模式“LPI”

在开始预调试之前，为以下部件设置一个固定的 IP 地址：
→ I/O 模块（如有）
→ 变频器
→ 水泵
→ 笔记本电脑/触摸面板 (Web HMI)

配置 *I/O* 模块（如有）

1. I/O 模块上模拟输入端的信号类型已设置（将跳线设置为电流或电压输入端）。
2. I/O 模块的 IP 地址和子网已设置为确定的网络配置。

   请参见 I/O 模块的安装及操作说明。
3. 连接 I/O 模块和网络。

注意！ I/O 模块不需要除 IP 地址之外的其他软件端设置！

配置变频器

1. 连接变频器和网络。
2. 将变频器的 IP 地址和子网设置为确定的网络配置。

   请参见变频器的安装及操作说明：参数 12-0
3. 将变频器的运行模式设置为“Off”。

   请参见变频器的安装及操作说明：按下操作件上的 Off 键。

配置水泵

1. 连接水泵和 DHCP 服务器。

   在首次配置时，网络中必须有 DHCP 服务器。Digital Data Interface 在出厂时设置为 DHCP。这样可通过 DHCP 服务器调用所有所需的网络参数。

2. 将水泵的 IP 地址和子网设置为已确定的网络配置。
   Settings ➔ Digital Data Interface ➔ Network Interface Settings [▶ 42]
3. 重新连接到所设置的 IP 地址上。
4. 用户帐号：“Regular user”：修改出厂密码。
   打开侧边栏菜单并更改用户资料。修改“Regular User”用户帐号的出厂密码 [▶ 41]
5. 设置时间/日期。
   为正确记录 Digital Data Interface 中的所有变更，请设置当前时间和日期。
   Settings ➔ Clock [▶ 42]
6. 设置语言。
   Settings ➔ Menu Language [▶ 42]
7. 将水泵的系统模式设置为“LPI”。
   Settings ➔ Digital Data Interface ➔ System Mode Selection [▶ 43]
   注意！ 等待页面刷新！
8. 在 Digital Data Interface 中设置变频器的类型和 IP 地址。
   Settings ➔ Frequency Converter ➔ IP / Type Select [▶ 45]
9. 自动执行参数化。
   Settings ➔ Frequency Converter ➔ Auto Setup [▶ 45]
10. 在 Digital Data Interface 中设置变频器的斜坡时间。
    Settings ➔ Frequency Converter ➔ Ramp Settings [▶ 46]
11. 在 Digital Data Interface 中为变频器的输入/输出端分配功能。
    Settings ➔ Frequency Converter ➔ Digital Inputs [▶ 46]
    Settings ➔ Frequency Converter ➔ Analog Inputs [▶ 46]
    Settings ➔ Frequency Converter ➔ Relay Outputs [▶ 47]
    Settings ➔ Frequency Converter ➔ Analog Outputs [▶ 47]
12. 在变频器上启动“自动电机调整”。
    请参见变频器的安装及操作说明：参数 1-29
    小心！ 进行完整的“自动电机调整”。简化的“自动电机调整”可能导致出现错误结果！
    注意！ 在“自动电机调整”之后检查电机的极数：参数 1-39！
13. 在 Digital Data Interface 中设置 I/O 模块的类型和 IP 地址（如有）。
    Settings ➔ I/O Extension ➔ IP / Type Select [▶ 48]
14. 在 Digital Data Interface 中为 I/O 模块的输入/输出端分配功能。
    Settings ➔ I/O Extension ➔ Digital Inputs [▶ 48]
    Settings ➔ I/O Extension ➔ Analog Inputs [▶ 49]（仅 Wilo I/O 2）
    Settings ➔ I/O Extension ➔ Relay Outputs [▶ 50]

激活水泵

1. 将变频器设置为“自动运行”。
   请参见变频器的安装及操作说明：按下操作件上的 Auto On 键。
2. 将水泵设置为“自动模式”。
   Function Modules ➔ Operating Mode（水泵） [▶ 52]
3. 校准参考特性曲线，以便能够使用堵塞识别功能。
   Function Modules ➔ Clog Detection ➔ Clog Detection – Teach Power Curve [▶ 52]

6.4.3 首次配置：系统模式“LSI”

在开始预调试之前，为以下部件设置一个固定的 IP 地址：
→ I/O 模块
→ 每个变频器
→ 每个水泵
→ 用于系统访问的 Master-IP
→ 笔记本电脑/触摸面板 (Web HMI)

配置 *I/O* 模块

1. I/O 模块上模拟输入端的信号类型已设置（将跳线设置为电流或电压输入端）。
2. I/O 模块的 IP 地址和子网已设置为确定的网络配置。

   请参见 I/O 模块的安装及操作说明。
3. 连接 I/O 模块和网络。

注意！ I/O 模块不需要除 IP 地址之外的其他软件端设置！

配置变频器 *1 – 4*

注意！ 对每个变频器重复步骤 1 – 3！

1. 连接变频器和网络。
2. 将变频器的 IP 地址和子网设置为确定的网络配置。

   请参见变频器的安装及操作说明：参数 12-0
3. 将变频器的运行模式设置为“Off”。

   请参见变频器的安装及操作说明：按下操作件上的 Off 键。

配置水泵 *1 – 4*

注意！ 对每个水泵重复步骤 1 – 13！

1. 连接水泵和 DHCP 服务器。

   在首次配置时，网络中必须有 DHCP 服务器。Digital Data Interface 在出厂时设置为 DHCP。这样可通过 DHCP 服务器调用所有所需的网络参数。
2. 将水泵的 IP 地址和子网设置为已确定的网络配置。

   Settings ➔ Digital Data Interface ➔ Network Interface Settings [▶ 42]
3. 重新连接到所设置的 IP 地址上。
4. 用户帐号：“Regular user”：修改出厂密码。

   打开侧边栏菜单并更改用户资料。修改“Regular User”用户帐号的出厂密码 [▶ 41]
5. 设置时间/日期。

   为正确记录 Digital Data Interface 中的所有变更，请设置当前时间和日期。

   Settings ➔ Clock [▶ 42]
6. 设置语言。

   Settings ➔ Menu Language [▶ 42]
7. 将水泵的系统模式设置为“LSI”。

   Settings ➔ Digital Data Interface ➔ System Mode Selection [▶ 43]

   注意！ 等待页面刷新！

   在系统模式“LSI”中，根据主机和从机划分设置和功能。注意有关 设置 [▶ 41] 和 功能模块 [▶ 51] 的概述。
8. 为系统分配水泵。

   Settings ➔ Digital Data Interface ➔ LSI Mode System Settings [▶ 44]

   注意！ 为每个水泵输入相同的主机 IP 地址！
9. 在 Digital Data Interface 中设置变频器的类型和 IP 地址。

   Settings ➔ Frequency Converter ➔ IP / Type Select [▶ 45]
10. 自动执行参数化。

    Settings ➔ Frequency Converter ➔ Auto Setup [▶ 45]
11. 在 Digital Data Interface 中设置变频器的斜坡时间。

    Settings ➔ Frequency Converter ➔ Ramp Settings [▶ 46]
12. 在 Digital Data Interface 中为变频器的输入/输出端分配功能。

    Settings ➔ Frequency Converter ➔ Digital Inputs [▶ 46]

    Settings ➔ Frequency Converter ➔ Relay Outputs [▶ 47]

    Settings ➔ Frequency Converter ➔ Analog Outputs [▶ 47]
13. 在变频器上启动“自动电机调整”。

请参见变频器的安装及操作说明：参数 1-29

小心！ 进行完整的“自动电机调整”。简化的“自动电机调整”可能导致出现错误结果！

注意！ 在“自动电机调整”之后检查电机的极数：参数 1-39！

配置系统设置

1. 调用系统的主机首页。

   输入 Master-IP 地址或点击 Slave 首页的房子图标。

2. 检查时间/日期的设置。

   Settings ➔ Clock [▶ 42]

3. 检查语言设置。

   Settings ➔ Menu Language [▶ 42]

4. 在 Digital Data Interface 中设置 I/O 模块的类型和 IP 地址。

   Settings ➔ I/O Extension ➔ IP / Type Select [▶ 48]

5. 在 Digital Data Interface 中为 I/O 模块的输入/输出端分配功能。

   Settings ➔ I/O Extension ➔ Digital Inputs [▶ 48]

   Settings ➔ I/O Extension ➔ Analog Inputs [▶ 49]

   Settings ➔ I/O Extension ➔ Relay Outputs [▶ 50]

6. 选择调控模式：Auto Mode Selection

   Function Modules ➔ Operating Mode ➔ Operating Mode（系统） [▶ 54]

7. 设置系统限值。

   Function Modules ➔ System Limits ➔ Levels [▶ 55]

   Function Modules ➔ System Limits ➔ Dry Run Sensor Selection [▶ 55]

   Function Modules ➔ System Limits ➔ Pump Limits and Changer [▶ 55]

   Function Modules ➔ System Limits ➔ Min/Max Frequency [▶ 56]

8. 配置调控模式的参数：
   - Level Control
     Function Modules ➔ Level Controller ➔ Stop Level [▶ 57]
     Function Modules ➔ Level Controller ➔ Level 1...6 [▶ 57]
   - PID
     Function Modules ➔ PID Controller ➔ PID Settings [▶ 57]
     Function Modules ➔ PID Controller ➔ Controller Parameter [▶ 58]
   - HE-Controller
     Function Modules ➔ High Efficiency(HE) Controller ➔ Control Settings [▶ 58]
     Function Modules ➔ High Efficiency(HE) Controller ➔ Pipe Settings [▶ 59]
     注意！ 如果已保存所有有关管路的数据，请执行“计算管路”！
     Function Modules ➔ High Efficiency(HE) Controller ➔ Tank Geometry [▶ 59]

激活水泵

注意！ 对每个水泵和每个变频器重复步骤 1 – 4！

1. 调用水泵的从机首页。
2. 将变频器设置为“自动运行”。

   请参见变频器的安装及操作说明：按下操作件上的 Auto On 键。

3. 将水泵设置为“自动模式”。

   Function Modules ➔ Operating Mode（水泵） [▶ 52]

4. 校准参考特性曲线，以便能够使用堵塞识别功能。

   Function Modules ➔ Clog Detection ➔ Clog Detection - Teach Power Curve [▶ 52]

激活系统

1. 调用系统的主机首页。
2. 将系统设置为“自动模式”：Operating Mode Selection

   Function Modules ➔ Operating Mode ➔ Operating Mode（系统） [▶ 54]

6.5 设置

注意

为进行设置，用户登录！

用户通过侧边栏菜单登录：
- 用户名: user
- 密码: user

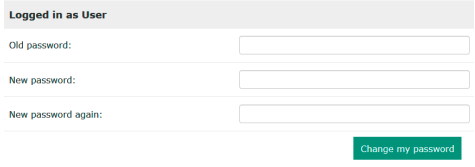
在首次配置时修改出厂密码！

与系统模式有关的设置概述。

设置	系统模式			
	DDI	LPI	LSI-Master	LSI-Slave
Menu Language	•	•	•	–
Clock	•	•	•	–
Units	•	•	–	•
Digital Data Interface				
Network Interface Settings	•	•	–	•
Proxy Settings	•	•	–	•
System Mode Selection	•	•	–	•
LPI Control Settings	–	•	–	–
LSI Mode System Settings	–	–	–	•
Limits Temperature Sensors	•	•	–	•
Limits Vibration Sensors	•	•	–	•
Frequency Converter				
IP / Type Select	–	•	–	•
Auto Setup	–	•	–	•
Ramp Settings	–	•	–	•
Digital Inputs	–	•	–	•
Analog Inputs	–	•	–	–
Relay Outputs	–	•	–	•
Analog Outputs	–	•	–	•
I/O Extension				
IP / Type Select	•	•	•	–
Digital Inputs	•	•	•	–
Analog Inputs （仅Wilo IO 2）	•	•	•	–
Relay Outputs	•	•	•	–
Alarm / Warning Types				
Changeable Alarms	•	•	–	•
Changeable Warnings	•	•	–	•

图例
– = 不存在，• = 存在

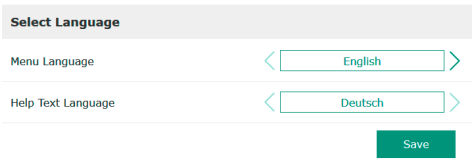
6.5.1 修改“Regular User”用户帐号的出厂密码



打开侧边栏菜单修改出厂密码，然后点击“Edit profile”。
→ Old password:输入当前密码（出厂时为：“user”）
→ New password:输入新密码：
  – 字母数字密码包括至少两个数字。
  – 长度：至少 6 个字符，最多 10 个字符。
→ New password again:确认新密码。
→ 点击“Change my password”应用新密码。

注意！ 如果密码丢失，请通知客户服务部！客户服务部可以恢复出厂密码。

6.5.2 Menu Language

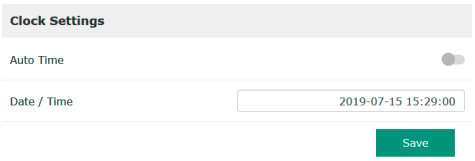


可单独设置菜单语言以及帮助文本的语言。

→ Menu Language
工厂设定：英语

→ Help Text Language
工厂设定：英语

6.5.3 Clock

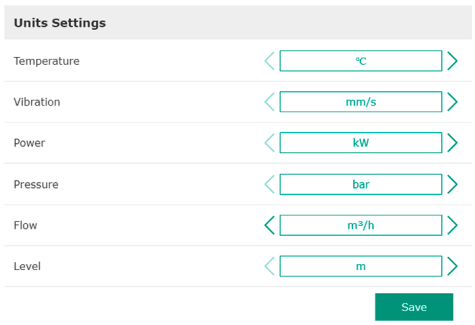


可通过 NTP 协议同步或手动设置日期和时间显示。

→ Auto Time
通过 NTP 协议同步时间和日期。在“Network Interface Settings”菜单中输入所需的 NTP 服务器（参见菜单：“Settings ➔ Digital Data Interface ➔ Network Interface Settings”）。
工厂设定：打开

→ Date / Time
手动设置时间和日期，禁用“Auto Time”功能，点击进入该框。自动打开一个窗口，包括日历和两个小时及分钟滑块。

6.5.4 Units



确定单位：

→ Temperature
工厂设定：°C
输入：°C，°F

→ Vibration
工厂设定：mm/s
输入：mm/s，in/s

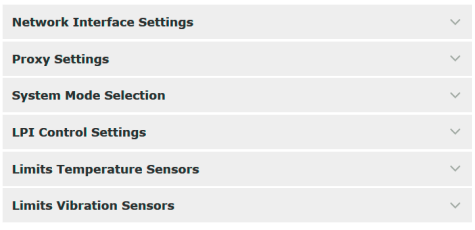
→ Power
工厂设定：kW
输入：kW，hp

→ Pressure
工厂设定：bar
输入：bar，psi

→ Flow
工厂设定：l/s
输入：l/s、m³/h、US.liq.gal/min

→ Level
工厂设定：m
输入：m，ft

6.5.5 Digital Data Interface



Digital Data Interface 基本设置：

→ Network Interface Settings
网络通讯设置

→ Proxy Settings
代理服务器设置

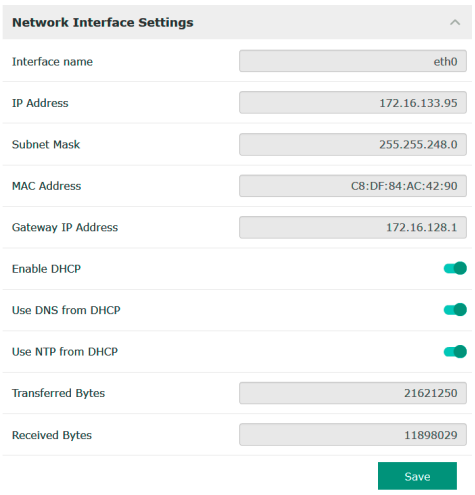
→ System Mode Selection（仅对登录的用户可见）
选择所需的系统模式 (DDI, LPI, LSI)

→ LPI Control Settings
有关水泵额定值规定的设置

→ Limits Temperature Sensors
警告和警报的极值

→ Limits Vibration Sensors
警告和警报的极值

6.5.5.1 Network Interface Settings



水泵访问本地网络的基本设置。

→ Interface name
Ethernet 接口的固定名称。

→ IP Address
Digital Data Interface 的 IP 地址。
工厂设定：通过 DHCP 传输

→ Subnet Mask
Digital Data Interface 的子网掩码。
工厂设定：通过 DHCP 传输

→ MAC Address
显示 MAC 地址。

→ Gateway IP Address
网关（路由器）的 IP 地址。
工厂设定：通过 DHCP 传输

→ Enable DHCP
通过 DHCP 协议自动传输本地网络设置。
工厂设定：
如果关闭 DHCP 协议，输入以下信息：

- IP Address
- Subnet Mask
- Gateway IP Address
- Custom DNS
  小心！如果输入无效的数值，在保存之后无法再访问水泵！

→ Use DNS from DHCP
通过 DHCP 协议传输 DNS 服务器的 IP 地址。
工厂设定：
如果关闭该功能或 DHCP 协议，则手动输入 DNS 服务器的 IP 地址。

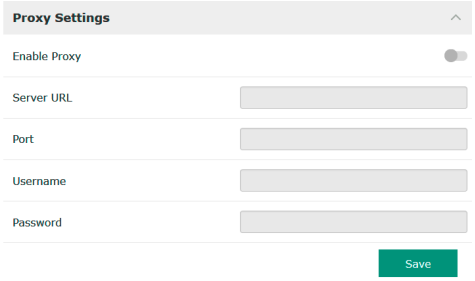
→ Custom DNS
DNS 服务器的 IP 地址。

→ Use NTP from DHCP
DHCP 服务器通过 NTP 协议传输当前时间和日期。
工厂设定：
如果关闭该功能或 DHCP 协议，则手动输入 NTP 服务器的 IP 地址/域名。

→ Custom NTP Server
用于同步时间的 NTP 服务器的地址。
工厂设定：pool.ntp.org

→ Transferred Bytes/Received Bytes
显示传输和接收的数据包。

6.5.5.2 Proxy Settings



通过代理服务器访问网络的基本设置。

→ Enable Proxy
工厂设定：关闭

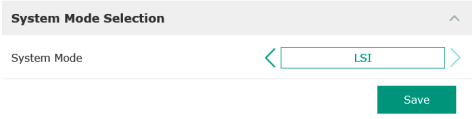
→ Server URL
代理服务器的域名或 IP 地址。

→ Port
通过其与服务器进行通讯的网络端口。

→ Username
登录用户名

→ Password
登录密码

6.5.5.3 System Mode Selection



控制装置包括三种不同的系统模式："DDI"、"LPI"和"LSI"。通过许可证密钥启用可能的系统模式。系统模式向下兼容。

→ System Mode Selection
工厂设定：与许可证有关
输入：DDI、LPI、LSI

各种系统模式的说明：

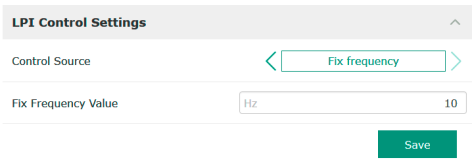
→ 系统模式 DDI

没有任何控制功能的系统模式。仅探测、分析和保存温度和震动传感器的值。通过运营者的上级控制装置控制水泵和变频器（如果有）。

→ 系统模式 LPI
用于变频器和堵塞识别的有控制功能的系统模式。水泵/变频器组合作为一个单元工作，通过水泵控制变频器。这样可以进行堵塞识别，在需要时启动清洁过程。通过运营者的上级控制装置根据液位控制水泵。

→ 系统模式 LSI
这一系统模式用于完全控制有最多 4 台水泵的泵站。这时一台水泵作为主机工作，其他所有水泵作为从机工作。主泵根据与设备有关的参数控制其他所有水泵。

6.5.5.4 LPI Control Settings



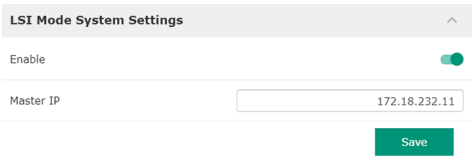
“LPI”系统模式的基本设置。

→ Control Source
上级控制装置的额定值规定。
工厂设定：Analog
输入：Analog、Bus、Fix frequency

- Analog
  向变频器或 I/O 模块模拟传输上级控制装置的值。**注意！必须使用“额定值”配置模拟输入端！**
- Bus
  通过 Ethernet 网络向水泵传输上级控制装置的值。使用 ModBus TCP 或 OPC UA 作为通讯协议。
- Fix frequency
  水泵以固定的频率运行。

→ Fix Frequency Value
如果在“Control Source”设置中选择“Fix frequency”值，则在这里输入相应的频率。
工厂设定：0 Hz
输入：25 Hz 至依据型号铭牌的最高频率 (f_{op})

6.5.5.5 LSI Mode System Settings

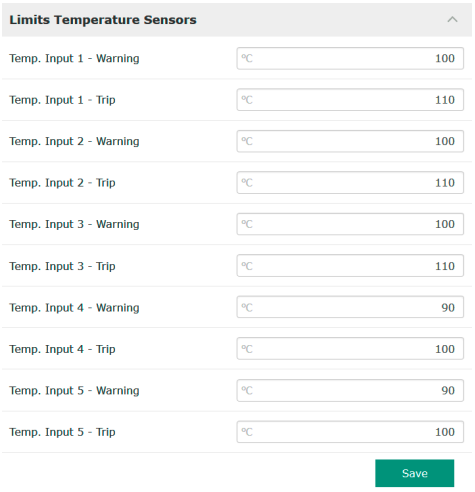


一个系统中最多可组合 4 个水泵。

→ Enable
激活系统中的水泵。
工厂设定：关

→ Master IP
固定的 IP 地址，通过该地址可以访问系统及系统首页。必须由运营者指定 IP 地址！通过该静态 IP 地址定义水泵与系统的从属关系。为系统的每个水泵输入 Master IP。主机功能自动分配给系统中的水泵（冗余主机）。
注意！在同一子网中设置全部 IP 地址（从机和主机）！

6.5.5.6 Limits Temperature Sensors



可能的温度传感器和输入极值概述。

温度传感器概述

编号	说明	显示屏
温度输入端 1	绕组温度 1	Winding Top/Bot 1
温度输入端 2	绕组温度 2	Winding 2
温度输入端 3	绕组温度 3	Winding 3
温度输入端 4	电机轴承温度上限	Bearing Top 4
温度输入端 5	电机轴承温度下限	Bearing Bot 5

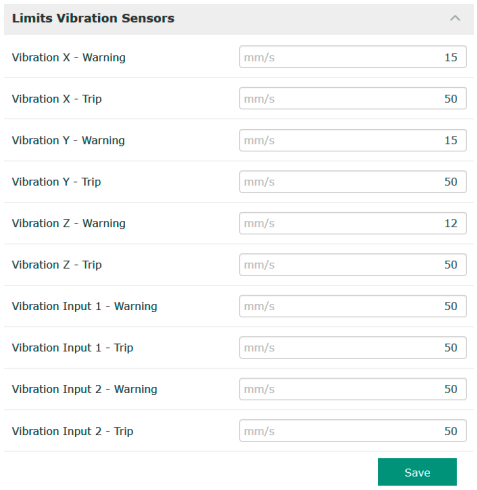
输入极值

→ Temp. Input 1 – Warning
警告极值，单位为 °C。
工厂设定：出厂时的要求
输入：0 °C 至出厂时的要求

→ Temp. Input 1 – Trip
水泵关闭极值，单位为 °C。
工厂设定：出厂时的要求
输入：0 °C 至出厂时的要求。该数值必须高于警告极值 2 °C。

图例
“1”代表输入端编号 1 至 5 的占位符。

6.5.5.7 Limits Vibration Sensors



可能的震动传感器和输入极值概述。

振动传感器概述

编号	说明	显示屏
X、Y、Z 振动	DDI 中的振动传感器	VibX, VibY, VibZ
输入端 1/输入端 2 振动	外部振动传感器的输入端	VibHut, VibTop, VibBot

输入极值

→ Vibration X – Warning
警告极值，单位为 mm/s。
工厂设定：出厂时的要求
输入：0% 至出厂时的要求

→ Vibration X – Trip
水泵关闭极值，单位为 mm/s。
工厂设定：出厂时的要求
输入：0% 至出厂时的要求。该数值必须高于警告极值 2%。

图例
“X”代表输入端编号 X、Y、Z、1、2 的占位符。

6.5.6 Frequency Converter

变频器基本设置：

→ IP / Type Select
与变频器通讯的设置

→ Auto Setup
变频器的自动配置

→ Ramp Settings
起动和制动斜坡的时间要求

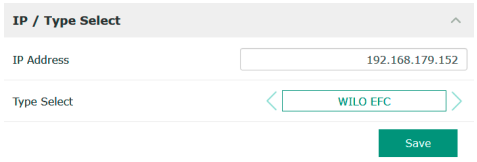
→ Digital Inputs
数字输入端的配置。

→ Analog Inputs
模拟输入端的配置。

→ Relay Outputs
继电器输出端的配置。

→ Analog Outputs
模拟输出端的配置。

6.5.6.1 IP / Type Select

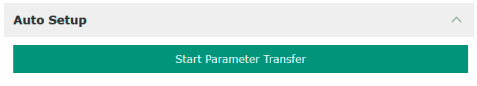


水泵和变频器之间通讯的基本设置。

→ IP Address
变频器的 IP 地址。

→ Type Select
选择恰当的变频器。
工厂设定：Wilo-EFC

6.5.6.2 Auto Setup



Digital Data Interface 通过自动设置参数配置所连接变频器的基本设置。请注意以下几点：

→ 自动参数设置覆盖变频器中的所有设置！
→ 自动参数设置配置数字输入端的占用情况！
→ 在自动设置参数之后，在变频器中执行自动电机调整！

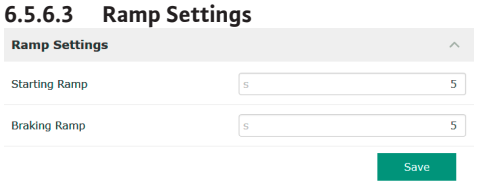
执行自动参数设置。

✓ 输入了变频器的 IP 地址。
✓ 选择了正确的变频器。
✓ 变频器处于“停止”位置

1. 点击“Start Parameter Transfer”
2. “Auto Setup”启动。

3. 在传输结束时出现信息“Succesfully Completed”。

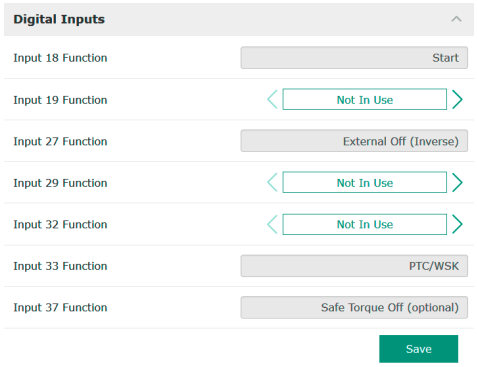
6.5.6.3 Ramp Settings



→ Starting Ramp
时间要求，单位为秒。
工厂设定：5 s
输入：1 至 20 s

→ Braking Ramp
时间要求，单位为秒。
工厂设定：5 s
输入：1 至 20 s

6.5.6.4 Digital Inputs



为相应的输入端分配可用的功能。输入端子的名称与变频器Wilo-EFC 上的名称一致。

通过自动参数设置规定预分配以下输入端：

→ Input 18 Function
功能：启动
说明：上级控制装置的接通/断开信号。

→ Input 27 Function
功能：External Off (Inverse)
说明：通过单独的开关远程关闭。**注意！ 输入端直接接通变频器！**

→ Input 33 Function
功能：PTC/WSK
说明：电机绕组中的硬件端温度传感器接口

→ Input 37 Function
功能：Safe Torque Off (STO) - 安全关闭
说明：在硬件方面通过变频器关闭水泵，不依赖于水泵控制器。不会自动重启（重启锁定功能）。
危险！ 如果在潜在爆炸环境内使用水泵，则在这里连接硬件方面的温度传感器和干转保护！为此在变频器内安装可选的插入式卡“MCB 112”。

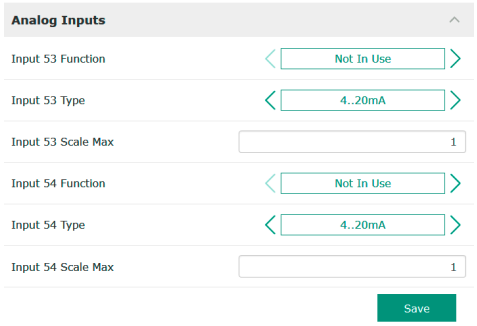
可为以下输入端自由分配可用的功能：

→ Input 19 Function
→ Input 29 Function
→ Input 32 Function
工厂设定：Not In Use
输入：

- High Water
  高水位警报信号。
- Dry Run
  干转保护信号。
- Leakage Warn
  外部密封室监控信号。在出现故障时输出一条故障信息。
- Leakage Alarm
  外部密封室监控信号。在出现故障时关闭水泵。可通过警报类型在配置中设置其他状态。
- Reset
  用于重置故障信息的外部信号。
- High Clogg Limit
  激活更高的堵塞识别公差（“Power Limit - High”）。

注意！ 输入端的分配必须与变频器上硬件方面的占用情况一致！

6.5.6.5 Analog Inputs



为相应的输入端分配可用的功能和输入端类型。输入端子的名称与变频器Wilo-EFC上的名称一致。

可配置以下输入端：
→ Input 53 Function
→ Input 54 Function

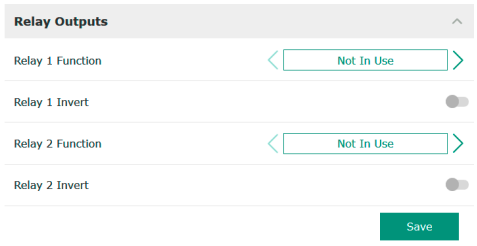
注意！ 分配必须与变频器上硬件方面的占用情况一致！

→ Input 53 Function/Input 54 Function
工厂设定：Not In Use
输入：
- External Control Value
  通过上级控制装置作为模拟信号规定控制水泵转速的额定值。
- Level
  探测当前液位，以探测数据。数字输出端上“上升”和“下降”电平功能的基础。
- Pressure
  探测当前系统压力，以探测数据。
- Flow
  探测当前流量，以探测数据。

→ Input 53 Type/Input 54 Type
同样在硬件方面在变频器上设置信号类型（电压 (U) 或电流 (I)）。注意变频器的安装及操作说明！
工厂设定：4...20 mA
输入：
- 0...20 mA
- 4 ~ 20 mA
- 0...10 V

→ Input 53 Scale Max/Input 54 Scale Max
工厂设定：1
输入：最大值作为带单位的真实数值。调节值的单位：
- Level = m
- Pressure = bar
- Flow = l/s
小数位分隔符：句号

6.5.6.6 Relay Outputs



为相应的输出端分配可用的功能。输出端子的名称与变频器Wilo-EFC 上的名称一致。

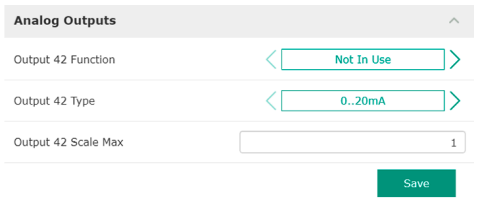
可配置以下输出端：
→ Relay 1 Function
→ Relay 2 Function

注意！ 分配必须与变频器上硬件方面的占用情况一致！

→ Relay 1 Function/Relay 2 Function
工厂设定：Not In Use
输入：
- Run
  水泵的单泵运行信号
- Rising Level
  上升电平下的信息。
- Falling Level
  下降电平下的信息。
- Error
  水泵的单泵故障信号：警报。
- Warning
  水泵的单泵故障信号：警告。
- Cleaning
  水泵的清洁序列开始时的信号。

→ Relay 1 Invert/Relay 2 Invert
输出端工作方式：正常或倒转。
工厂设定：关闭（正常）

6.5.6.7 Analog Outputs



为相应的输出端分配可用的功能。输出端子的名称与变频器Wilo-EFC 上的名称一致。

可配置以下输出端：

→ Output 42 Function

注意！ 分配必须与变频器上硬件方面的占用情况一致！

→ Output 42 Function
工厂设定：Not In Use
输入：

- Frequency
  显示当前实际频率。
- Level
  显示当前液位。**注意！ 在显示时，必须在一个输入端上连接相应的信号变送器！**
- Pressure
  显示当前工作压力。**注意！ 在显示时，必须在一个输入端上连接相应的信号变送器！**
- Flow
  显示当前流量。**注意！ 在显示时，必须在一个输入端上连接相应的信号变送器！**

→ Output 42 Type
工厂设定：4...20 mA
输入：

- 0...20 mA
- 4 ~ 20 mA

→ Output 42 Scale Max
工厂设定：1
输入：最大值为不包括单位的真实数值，小数位分隔符：句号

6.5.7 I/O Extension

I/O 模块的基本设置（输入/输出端扩展）：

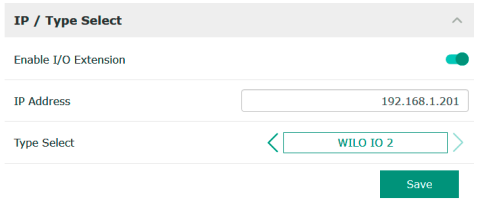
→ IP / Type Select
与 I/O 模块通讯的设置

→ Digital Inputs
数字输入端的配置。

→ Analog Inputs
模拟输入端的配置（仅在 Wilo I/O 2 中可用）。

→ Relay Outputs
继电器输出端的配置。输出端的数量与选定的 I/O 模块有关。

6.5.7.1 IP / Type Select



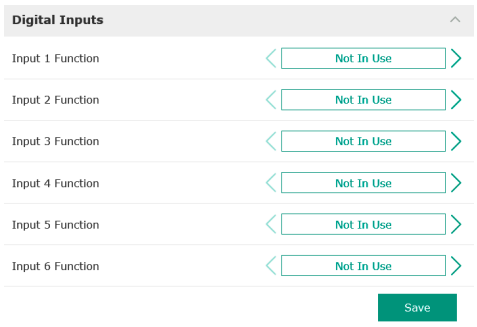
水泵和 I/O 模块之间通讯的基本设置。

→ Enable I/O Extension
打开/关闭功能。
工厂设定：关闭

→ IP Address
I/O 模块的 IP 地址。

→ Type Select
选择 I/O 模块。
工厂设定：Wilo IO 1
输入：Wilo IO 1 (ET-7060), Wilo IO 2 (ET-7002)

6.5.7.2 Digital Inputs



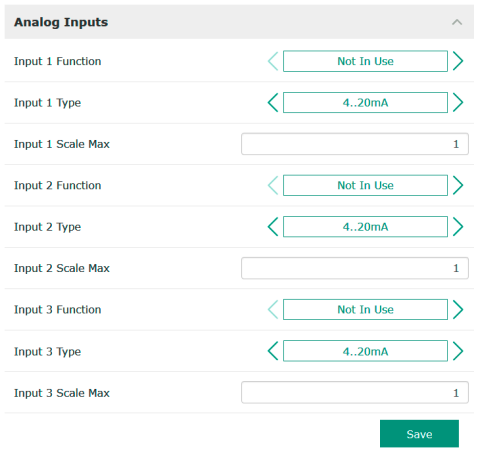
为相应的输入端分配可用的功能。输入端子的名称与 I/O 模块上的名称一致。可为以下输入端自由分配可用的功能：

→ Input 1 Function
→ Input 2 Function
→ Input 3 Function
→ Input 4 Function
→ Input 5 Function
→ Input 6 Function
工厂设定：Not In Use
输入：
注意！ 在 LPI 系统模式下，I/O 模块上的功能与变频器的功能相同。以下说明均基于 LSI 系统模式。

- High Water
  高水位警报信号。
- Dry Run
  干转保护信号。
- Reset
  用于重置故障信息的外部信号。
- System Off
  外部信号，用于关闭系统。
- Trigger Start Level
  启动泵出过程。从集水坑中抽水，直至达到关闭水位。
- Alternative Start Level
  激活备选接通水位。

注意！ 分配必须与 I/O 模块上硬件方面的占用情况一致！

6.5.7.3 Analog Inputs



为相应的输入端分配可用的功能。输入端子的名称与 I/O 模块上的名称一致。可为以下输入端自由分配可用的功能：

→ Input 1 Function
→ Input 2 Function
→ Input 3 Function

设置

→ Input 1 Function ... Input 3 Function
工厂设定：Not In Use
输入：
注意！ 在 LPI 系统模式下，I/O 模块上的功能与变频器的功能相同。以下说明均基于 LSI 系统模式。

- Level
  在 LSI 系统模式下为调控模式规定额定值。
  注意！ LSI 系统模式的前提条件！为输入端分配此功能。
- Pressure
  探测当前系统压力，以探测数据。
  注意！ 可作为调节值用于 PID 控制器！
- Flow
  探测当前流量，以探测数据。
  注意！ 可作为调节值用于 PID 和 HE 控制器！
- External Control Value
  源自上级控制器的额定值规定，用于将泵站作为模拟信号进行控制。**注意！ 在 LSI 系统模式下，泵站独立于上级控制系统进行工作。如须由上级控制系统规定额定值，请咨询客户服务部！**

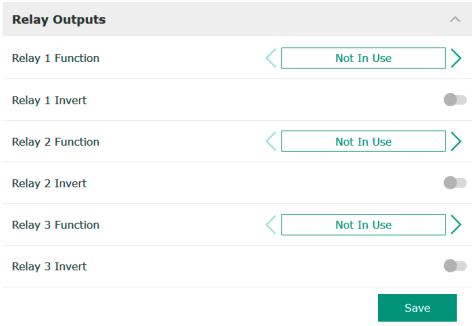
→ Input 1 Type ... Input 3 Type
向 I/O 模块传输选定的测量范围。**注意！ 在硬件方面设置信号类型（电流或电压）。注意生产商说明书！**
工厂设定：4...20 mA
输入：

- 0...20 mA
- 4...20 mA
- 0...10 V

→ Input 1 Scale Max ... Input 3 Scale Max

工厂设定：1
输入：最大值作为带单位的真实数值。调节值的单位：
- Level = m
- Pressure = bar
- Flow = l/s
小数位分隔符：句号

6.5.7.4 Relay Outputs



为相应的输出端分配可用的功能。输出端子的名称与 I/O 模块上的名称一致。可为以下输出端自由分配可用的功能：
→ Relay 1 Function
→ Relay 2 Function
→ Relay 3 Function
→ Relay 4 Function
→ Relay 5 Function
→ Relay 6 Function

注意！ Wilo IO 2 只有三个继电器输出端！

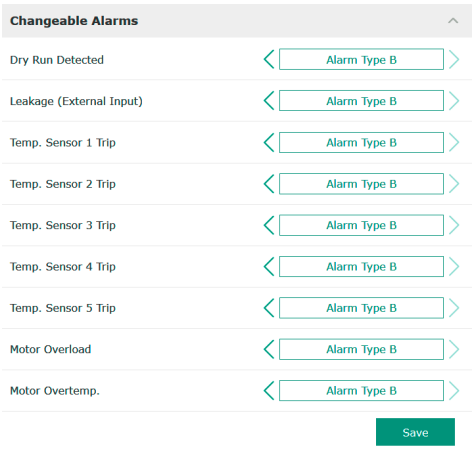
设置
→ Relay 1 Function ... Relay 6 Function
工厂设定：Not In Use
输入：
注意！ 在 LPI 系统模式下，I/O 模块上的功能与变频器的功能相同。以下说明均基于 LSI 系统模式。
- Run
  集中运行信号
- Rising Level
  上升电平下的信息。
- Falling Level
  下降电平下的信息。
- System Warning
  集中故障信号：警告。
- System Error
  集中故障信号：错误。
- Cleaning
  水泵的清洁序列激活时的信号。

→ Relay 1 Function ... Relay 6 Function
输出端工作方式：正常或倒转。
工厂设定：关（正常）

6.5.8 Alarm / Warning Types

对于特定警报和警告信息，可分两个等级规定优先级。

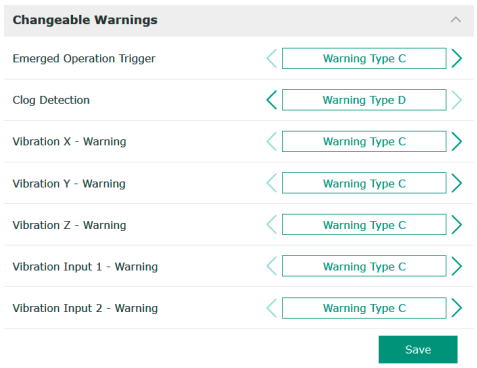
6.5.8.1 Changeable Alarms



可以为显示的警报信息规定以下优先级：
→ Alert Type A：在出现故障时关闭水泵。必须手动复位警报信息：
- 首页上的Reset Error
- 变频器或 I/O 模块上的“Reset”功能
- 通过现场总线传输的相应信号

→ Alert Type B：在出现故障时关闭水泵。如果排除了故障，将自动复位警报信息。

6.5.8.2 Changeable Warnings



可以为显示的警告信息规定以下优先级：

→ Warning Type C：这些警告可能接通变频器或 I/O 模块的继电器输出端。

→ Warning Type D：仅显示和记录这些警告。

6.6 功能模块

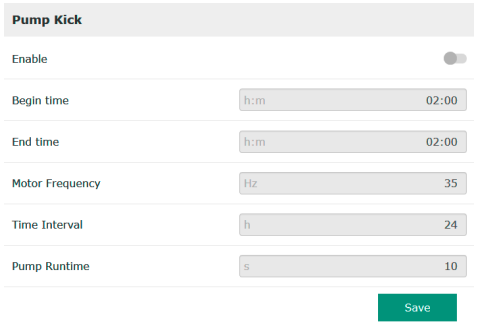
与系统模式有关的功能概述。

功能模块	系统模式			
	DDI	LPI	LSI-Master	LSI-Slave
Pump Kick	–	•	–	•
Emerged Operation	–	•	–	•
Operating Mode（水泵）	–	•	–	•
Clog Detection	–	•	–	•
Anti-Clogging Sequence	–	•	–	•
Operating Mode（系统）	–	–	•	–
System Limits	–	–	•	–
Level Controller	–	–	•	–
PID Controller	–	–	•	–
High Efficiency(HE) Controller	–	–	•	–

图例

– = 不存在，• = 存在

6.6.1 Pump Kick



为了避免水泵长时间处于休止状态，可以循环运行水泵。

→ Enable
打开和关闭功能。
工厂设定：关闭

→ End time 和 Begin time
在该时间段以外，强制循环运行水泵。
工厂设定：00:00
输入：hh:mm

→ Motor Frequency
水泵循环运行的频率。
工厂设定：35 Hz
输入：25 Hz 至依据铭牌的最高频率

→ Time Interval
两次水泵循环运行之间允许的休止状态时间。
工厂设定：24 h
输入：0 至 99 h。

→ Pump Runtime
水泵循环运行时水泵的运行时间。
工厂设定：10 s
输入：0 至 30 s

6.6.2 Emerged Operation

电机绕组配备温度监控装置。该监控允许水泵非浸入运行，而不会达到最高绕组温度。通过 Pt100 传感器探测温度。

→ Enable
打开和关闭功能。
工厂设定：关闭

→ Restart Hysteresis
按其重新接通的“两点式控制器”极限温度的温差。**注意！只有“两点式控制器”运行模式需要！**
工厂设定：5 °C
输入：1 至 20 °C

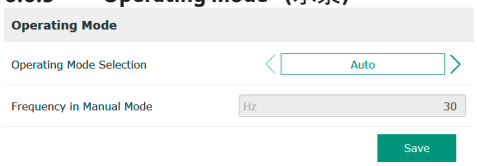
→ Temperature Limit
如果达到设置的极限温度，将激活限温器。
工厂设定：出厂时的绕组温度警告阈值
输入：40 °C 至出厂时的绕组关闭温度

→ Operating Mode
工厂设定：On/Off
输入：On/Off（两点式控制器）或 PID

– On/Off（两点式控制器）
在达到设置的极限温度时断开水泵。一旦重新按设置的磁滞值降低绕组温度，水泵将重新接通。

– PID
为避免关闭水泵，根据绕组温度调节电机转速。电机转速随绕组温度升高而降低。这样水泵可长时间运行。

6.6.3 Operating Mode（水泵）



→ Operating Mode Selection
规定在哪种运行模式下使用水泵。
工厂设定：关闭
输入：Auto、Manual或Off

– Off
水泵关闭。

– Manual
手动打开水泵。在点击按键“Off”或达到关闭液位前，水泵一直运行。
注意！在手动运行时，输入工况点的频率！（参见菜单：“Function Modules ➔ Operating Mode ➔ Frequency in Manual Mode”）
注意！“LSI”系统模式：只有当“关闭”主运行模式时，才能手动运行！

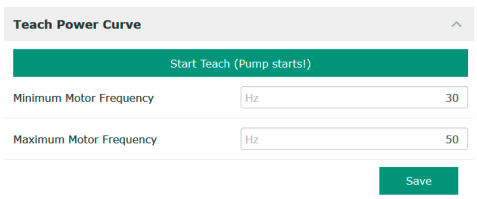
– Auto
自动运行水泵。
“LPI”系统模式：通过上级控制装置规定额定值。
“LSI”系统模式：通过系统主机规定额定值。

→ Frequency in Manual Mode
在手动运行时对工况点的频率要求。
工厂设定：0 Hz
输入：25 Hz 至依据铭牌的最高额定频率

6.6.4 Clog Detection

水泵采用一种可识别水力部件内堵塞的算法。算法的基础是额定功率与参考特性曲线的偏差。通过**“示教阶段”**校准参考特性曲线。堵塞识别的框架条件保存在**“设置”**中。

6.6.4.1 Clog Detection – Teach Power Curve



为激活堵塞识别，必须校准参考特性曲线。

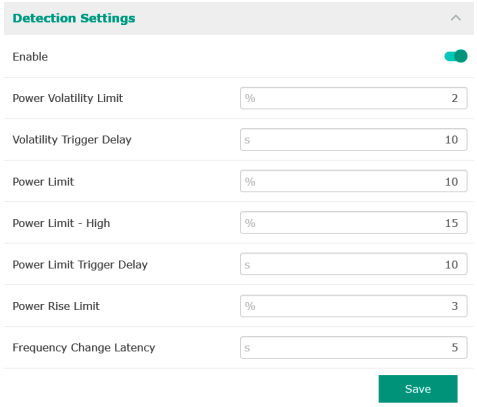
→ Minimum Motor Frequency
堵塞识别从它开始工作的最低频率。
工厂设定：30 Hz
输入：1 Hz 至依据铭牌的最高额定频率

→ Maximum Motor Frequency
堵塞识别在它以下开始工作的最高频率。
工厂设定：依据铭牌的额定频率
输入：1 Hz 至依据铭牌的最高额定频率

如果设置了所有值，通过点击“Start Teach (Pump starts!)”按键启动示教阶段。当示教阶段结束时，在屏幕上进行反馈。

注意！ 在示教阶段中，不进行堵塞识别！

6.6.4.2 Clog Detection – Detection Settings



定义堵塞识别的框架条件。**注意！ 为激活堵塞识别，保存有一条参考特性曲线**（➔“Teach Power Curve”）

→ Enable
打开和关闭功能。
工厂设定：关闭

→ Power Volatility Limit
与平均功耗相比允许的波动，单位为 %。
工厂设定：2%
输入：0 至 100%

→ Volatility Trigger Delay
如果在设置的时长内与平均功耗相比允许的波动大于允许的波动，则启动一个清洁过程。
工厂设定：10 s
输入：0 至 60 s

→ Power Limit
与参考特性曲线相比允许的波动，单位为 %。
工厂设定：10%
输入：0 至 100%

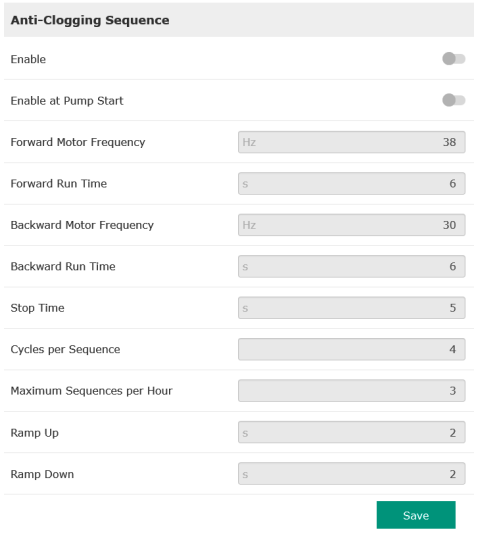
→ Power Limit Trigger Delay
如果在设置的时长内与参考特性曲线相比允许的偏差大于允许的偏差，则启动一个清洁过程。
工厂设定：10 s
输入：0 至 60 s

→ Power Limit – High
如果激活了数字输入端“High Clog Limit”，与参考特性曲线相比允许的波动，单位为 %。
工厂设定：15%
输入：0 至 100%

→ Power Rise Limit
比较正常运行和堵塞识别期间的平均功耗。记录正常运行和堵塞识别期间的平均功耗。在出厂时设定了记录时长。相互比较两个值。如果堵塞识别期间的值以设置的因数高于正常运行时的数值，则启动清洁过程。
工厂设定：3%
输入：0 至 100%

→ Frequency Change Latency
在保存用于计算的新数据之前，切换频率之后的时长。
工厂设定：5 s
输入：0 至 60 s

6.6.5 Anti-Clogging Sequence



当激活堵塞识别时，在需要时水泵可启动一个清洁序列。为解决并泵出堵塞，水泵交替向后和向前运行多次。

→ Enable
打开和关闭功能。
工厂设定：关闭

→ Enable at Pump Start
在每个泵送过程开始之前，首先启动一个清洁序列。
工厂设定：关闭

→ Forward Motor Frequency
清洁序列期间向前运行的频率要求。
工厂设定：38 Hz
输入：0 至 60 Hz

→ Forward Run Time
向前运行的运行时间。
工厂设定：6 s
输入：0 至 30 s

→ Backward Motor Frequency
清洁序列期间向后运行的频率要求。
工厂设定：30 Hz
输入：0 至 60 Hz

→ Backward Run Time
向后运行的运行时间。
工厂设定：6 s
输入：0 至 30 s

→ Stop Time
向前和向后运行期间的休止状态时间。
工厂设定：5 s
输入：0 至 10 s

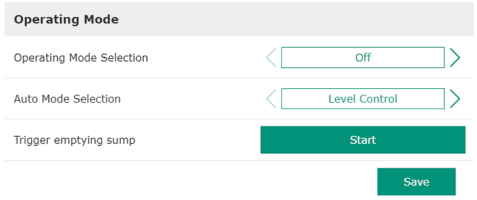
→ Cycles per Sequence
一个清洁序列期间向前和向后运行的次数。
工厂设定：4
输入：1 至 10

→ Maximum Sequences per Hour
一小时内的最多清洁序列数量。
工厂设定：3
输入：1 至 10

→ Ramp Up
电机从 0 Hz 至设定频率的启动时间。
工厂设定：2 s
输入：0 至 10 s

→ Ramp Down
电机从设置的频率至 0 Hz 的关闭时间。
工厂设定：2 s
输入：0 至 10 s

6.6.6 Operating Mode（系统）



确定系统的基本设置。

→ Operating Mode Selection
确定系统在哪种运行模式下工作。
工厂设定：Off
输入：Auto，Off

- Off
  系统关闭。可通过相应水泵的首页激活各个水泵的手动模式。
- Auto
  通过在“Auto Mode Selection”下设置的控制器自动运行系统。

→ Auto Mode Selection
确定由哪个控制器控制系统。
工厂设定：Level Control
输入：Level Control、PID、HE-Controller

→ Trigger emptying sump

启动手动泵送过程。运行至所设置液位采集的指定关闭/停止水位的水泵已达到最大数量（请参见 System Limits ➔ Pump Limits and Changer）。

6.6.7 System Limits

确定系统允许的使用限值：

→ Levels
确定高水位和干转保护的水位。

→ Dry Run Sensor Selection
确定干转运行的信号源。

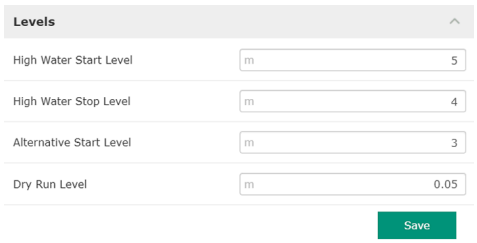
→ Pump Limits and Changer
用于定期更换水泵的设置。

→ Min/Max Frequency
确定最低和最高工作频率。

→ Start Frequency
确定提高后的水泵启动工作频率。

→ Alternative Stop Level
备选关闭水位，用于集水坑的完全排水和水位探头的通风。

6.6.7.1 Levels



确定接通和关闭水泵的不同液位。**注意！ 连接液位传感器以检测液位！**

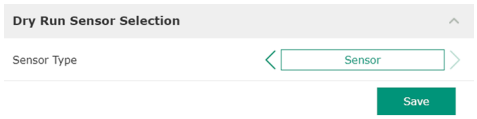
→ High Water Start Level
达到所设置水位的水泵已达到最大数量（请参见 System Limits ➔ Pump Limits and Changer）。在 Data Logger 中进行输入。
工厂设定：100 m
输入：0.05 至 100 m

→ High Water Stop Level
达到设置的水位时，关闭所有额外启动的水泵。只留下控制系统需要的水泵继续运行。在 Data Logger 中进行输入。
工厂设定：100 m
输入：0.05 至 100 m

→ Alternative Start Level
备选接通水位，用于提前对集水坑进行泵送。这种先行式的接通水位可以提高特殊情况下集水坑的储备体积容量，例如暴雨时。为 I/O 模块上的数字输入端分配“Alternative Start Level”功能，以激活备选接通水位。达到所设置水位的水泵已达到最大数量（请参见 System Limits ➔ Pump Limits and Changer）。
工厂设定：100 m
输入：0.05 至 100 m

→ Dry Run Level
达到所设置的水位时，关闭所有水泵。在 Data Logger 中进行输入。
工厂设定：0.05 m
输入：0.05 至 100 m

6.6.7.2 Dry Run Sensor Selection



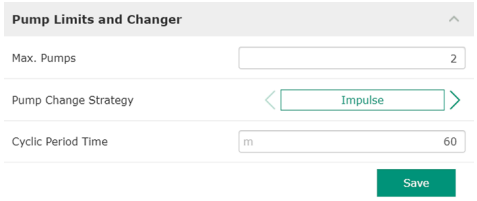
确定用于干转运行的传感器。

→ Sensor Type
工厂设定：Sensor
输入：Sensor，Dry Run Input

– Sensor
通过液位传感器确定干转运行水位。

– Dry Run Input
通过一个数字输入端传输针对干转运行水位的信号。

6.6.7.3 Pump Limits and Changer



为了避免出现各水泵运行时间不均匀的问题，会定期切换基本负荷水泵。

→ Max. Pumps
系统中可以同时运行的水泵的最大数量。
工厂设定：2
输入：1 至 4

→ Pump Change Strategy
用于更换水泵的基本控制系统。
工厂设定：Impulse
输入：Impulse，Cyclic

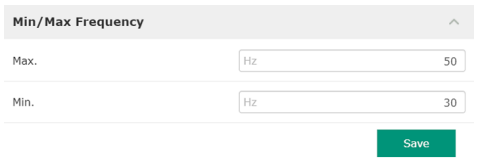
– Impulse

在所有水泵停止后进行水泵更换。

– Cyclic
在“Cyclic Period Time”下设置的时间结束后进行水泵更换。

→ Cyclic Period Time
如果设置了切换模式“Cyclic”，则在此处输入需在多久后进行水泵更换。
工厂设定：60 min
输入：1 至 1140 min

6.6.7.4 Min/Max Frequency



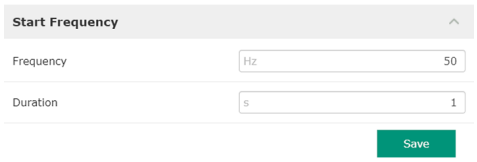
确定系统中水泵的最低和最高工作频率：

→ Max.
系统中水泵的最高工作频率。
工厂设定：最高频率参见型号铭牌
输入：由最低到最高频率参见型号铭牌

→ Min.
系统中水泵的最低工作频率。
工厂设定：最低频率参见型号铭牌
输入：由最低到最高频率参见型号铭牌

注意！ 输入受水泵的出厂设置限制！

6.6.7.5 Start Frequency



确定提高后的水泵启动工作频率。

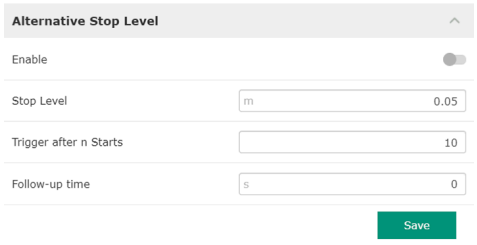
→ Frequency
水泵启动时的工作频率。
工厂设定：最高频率参见型号铭牌
输入：由最低到最高频率参见型号铭牌

注意！ 只有当控制器的额定频率低于提高后的启动频率时，该功能才激活。

注意！ 如果所设置的值等于最低频率，则禁用该功能。

→ Duration
在所设置的时间内，水泵以提高后的工作频率运行。然后，根据调控模式对频率进行自定义调节。
工厂设定：1 s
输入：1 至 30 s

6.6.7.6 Alternative Stop Level



备选关断水位，用于降低集水坑中的液位并为液位传感器通风。在达到设定的泵送循环数量后激活备选关断水位。

注意！ 通过针对干转保护的水位值设置关断水位！

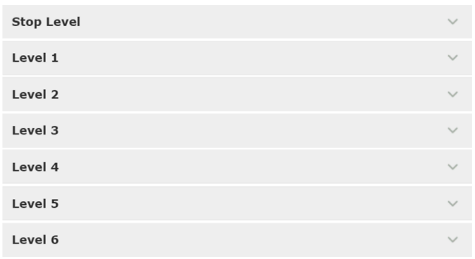
→ Enable
打开/关闭功能。
工厂设定：关闭

→ Stop Level
确定所需液位。
工厂设定：0.05 m
输入：0.05 至 100 m

→ Trigger after n Starts
备选关断水位激活前的泵送循环数量。
工厂设定：10
输入：2 至 100

→ Follow-up time
关闭前水泵的空转时间。
工厂设定：0 s
输入：0 至 300 s

6.6.8 Level Controller

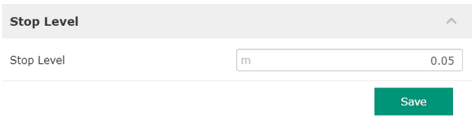


确定各个切换水位：

→ 停止水位
所有水泵的关断水位。

→ 水位 1 至 6
确定最多 6 个切换水位。

6.6.8.1 Stop Level



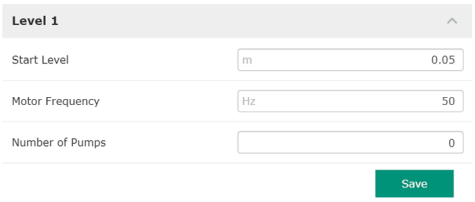
所有水泵的关断水位。

注意！ 通过针对干转保护的水位值设置关断水位！

注意！ 如果使用了“备选关断水位”，则通过“备选关断水位”的水位值设置该水位值！

→ Stop Level
工厂设定：0.05 m
输入：0.05 至 100 m

6.6.8.2 Level 1...6



确定最多 6 个用于控制水泵的不同切换水位。**注意！ 不必按顺序确定切换水位！**

→ Start Level
针对泵送过程的启动水位。
工厂设定：0.05 m
输入：0.05 至 100 m

→ Motor Frequency
针对泵送过程工作频率的规定。
工厂设定：水泵的最低频率
输入：水泵的最低频率至水泵的最高频率参见型号铭牌

→ Number of Pumps
针对泵送过程启动的水泵数量。
工厂设定：0
输入：0 至 4

注意！ 数值 0 表示禁用水位规定参数！

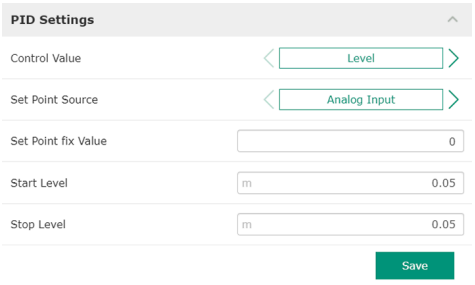
6.6.9 PID Controller

针对水泵控制的设置：

→ PID Settings
PID 控制的基本设置。

→ Controller Parameter
PID 控制器的基本设置。

6.6.9.1 PID Settings



PID 控制的基本设置。

→ Control Value
确定控制特征参数。
工厂设定：Level
输入：Level、Pressure、Flow

→ Set Point Source
控制系统的额定值规定。
工厂设定：Analog Input
输入：Analog Input、Bus Input、Fix

- Analog Input
将上级控制系统的数值以模拟方式传输到 I/O 模块 2 (ET-7002) 上。**注意！ 为模拟输入端配置值“额定值”！**
- Bus Input
通过 Ethernet 网络向水泵传输上级控制系统的值。使用 ModBus TCP 或 OPC UA 作为通讯协议。
- Fix
额定值的固定规定。

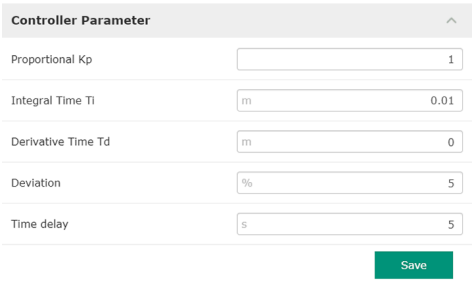
→ Set Point fix Value

如果在“Set Point Source”设置中选择了“Fix”值，则在此处输入相应的额定值。
工厂设定：0
输入：自由输入所需额定值。调节值的单位：
– Level = m
– Pressure = bar
– Flow = l/s

→ Start Level
达到设置的水位时，启动至少一个水泵。所启动水泵的实际数量取决于额定值的偏差。在“System Limits”菜单中设置需要启动的水泵的最大数量（请参见 System Limits ➔ Pump Limits and Changer）。
工厂设定：0.05 m
输入：0.05 至 100 m

→ Stop Level
达到所设置的水位时，关闭所有水泵。
工厂设定：0.05 m
输入：0.05 至 100 m

6.6.9.2 Controller Parameter



PID 控制器的基本设置。

→ Proportional Kp
增压系数
工厂设定：1
输入：-1000 至 1000
注意！ 将比例值 Kp 设置为负 (-) 以进行液位调节！

→ Integral Time Ti
精调/积分时间
工厂设定：0.01 min
输入：0 至 10000 min

→ Derivative Time Td
微分时间/保留时间
工厂设定：0 min
输入：0 至 1000 min
注意！ 微分分量 Td 通常不用在污水处理应用中。数值最好设置为“0”！

→ Deviation
实际值与额定值之间允许的偏差。
工厂设定：5 %
输入：0 至 100%
调控条件
– 额定值偏差超出定义的限值。
– 输出频率达到**最高**频率。
如果两个条件在定义的时间段内适用，则**接通**水泵。
– 额定值偏差超出定义的限值。
– 输出频率达到**最低**频率。
如果两个条件在定义的时间段内适用，则**关闭**水泵。
最高和最低频率的相关信息请参见 System Limits ➔ Min/Max Frequency。

→ Time delay
延迟时间/空转时间
工厂设定：5 s
输入：0 至 300 s

6.6.10 High Efficiency(HE) Controller

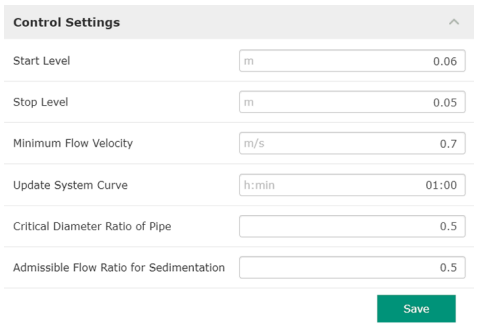
针对水泵控制的设置：

→ Control Settings
HE 控制器的基本设置。

→ Pipe Settings
管路的数据。

→ Tank Geometry
集水坑几何形状的数据。

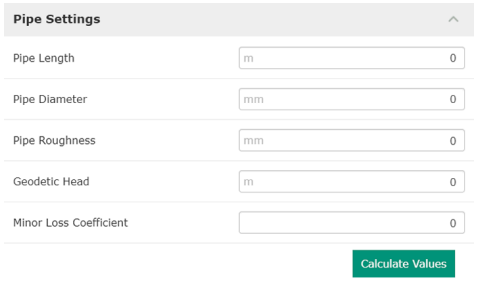
6.6.10.1 Control Settings



针对水泵控制的基本设置。

- Start Level
  达到所设置的水位时，启动一个水泵。
  工厂设定：0.05 m
  输入：0.05 至 100 m
- Stop Level
  达到所设置的水位时，关闭激活的水泵。
  工厂设定：0.05 m
  输入：0 至 100 m
- Minimum Flow Velocity
  确定管路中的最低流速。
  工厂设定：0.7 m/s
  输入：0 至 100 m/s
- Update System Curve
  系统曲线校准的开始时间。
  工厂设定：00:00
  输入：00:00 至 23:59
- Critical Diameter Ratio of Pipe
  理论与实际管路截面的允许比率。低于允许的比率时，说明管路中存在沉积物。以额定频率冲洗管路。
  工厂设定：0.5
  输入：0 至 1
- Admissible Flow Ratio for Sedimentation
  预调试时以及冲洗前和冲洗期间所输送流量的允许比率。超过允许的比率时结束冲洗。
  工厂设定：0.5
  输入：0 至 1

6.6.10.2 Pipe Settings

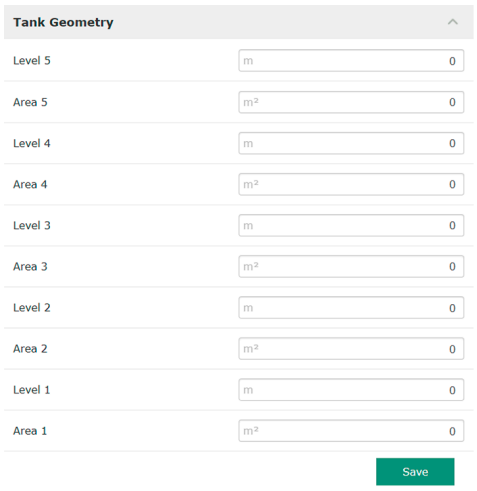


管路的数据。

- Pipe Length
  与下一个泵站之间管路的总长。
  工厂设定：0 m
  输入：0 至 100000 m
- Pipe Diameter
  工厂设定：0 mm
  输入：0 至 10000 mm
- Pipe Roughness
  绝对管道粗糙度的数据。
  工厂设定：0 mm
  输入：0 至 100 mm
- Geodetic Head
  水泵中水面与所连接排放管路中最高点之间的高度差。
  工厂设定：0 m
  输入：0 至 100 m
- Minor Loss Coefficient
  用于计算排放管路中压力损失的尺寸参数。
  工厂设定：0
  输入：0 至 100

点击“Calculate Values”，应用指定的数值。

6.6.10.3 Tank Geometry



集水坑几何形状的数据。系统通过最多 5 个参数计算集水坑的几何形状。注意！ 不必按顺序指定参数！

→ Level 1...5
工厂设定：0 m
输入：0 至 100 m

→ Area 1...5
工厂设定：0 m²
输入：0 至 100 m²
注意！ 数值 **0** 表示禁用相应的参数！
注意！ 指定至少两个表面以确保功能正确：圆柱形集水坑几何形状，最低和最高水位！

7 额外信息

7.1 Backup/Restore

可以使用以下功能：

→ Backup/Restore
可以保存当前配置或还原文件中的配置。

→ Restore Configuration Files
将 Digital Data Interface 恢复为出厂状态。

备份配置

1. 点击“Save settings to local file”旁的“Save”。
2. 在选择窗口中选择存储位置。
3. 在选择窗口中点击“保存”。

► 配置已保存。

还原配置

1. 点击“Load backup from local file”旁的“Browse”。
2. 在选择窗口中选择所需配置的存储位置。
3. 选择文件。
4. 在选择窗口中点击“打开”。

► 加载配置。

► 配置加载完毕后显示信号“Successfully loaded backup file!”。

恢复出厂状态

1. 点击“Restore”。
   ⇒ 显示安全提问：All existing configurations will be lost and default values will be loaded.
2. 点击“Ok”确认安全提问。

► 加载出厂状态。

► 出厂状态加载完毕后显示信号“Configuration files are restored successfully”。

7.2 Software update

可以使用以下功能：

→ Install new software bundle
安装 Digital Data Interface 的新固件。

→ Update device's license
为运行模式“LPI”或“LSI”安装 Digital Data Interface 的升级文件。

Install new software bundle

在升级固件之前保存当前配置的备份！此外，建议在客户环境中使用生产系统之前，先对其进行内部测试。尽管品质保证措施完善，但 WILO SE 仍无法排除所有风险。

注意！ 如果水泵在“LSI”系统模式下运行，则在更新系统中的固件前禁用水泵！

1. 调用从泵的首页。
2. 点击 Settings。
3. 点击 Digital Data Interface。
4. 点击 LSI Mode System Settings。
5. 禁用 LSI 模式。
6. 固件更新之后再次激活 LSI 模式。

✓ LSI 模式：水泵的 LSI 模式已禁用。

✓ 水泵已关闭。

1. 点击“Pick update bundle”旁的“Browse”。
2. 在选择窗口中选择文件的存储位置。
3. 选择文件。
4. 在选择窗口中点击“打开”。
5. 点击“Submit”。
   ⇒ 数据传输到 Digital Data Interface 上。文件传输完毕后，有关新版本的详细信息将显示在右侧窗口中。
6. 执行更新：点击“Apply”。

► 加载新固件。

► 固件加载完毕后显示信号“Bundle uploaded successfully”。

Update device's license

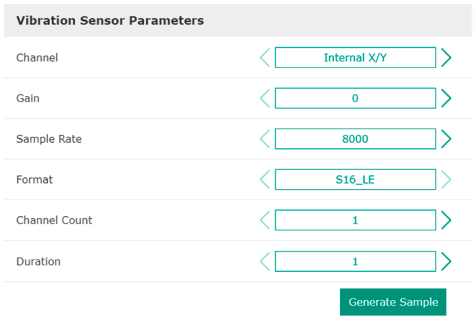
Digital Data Interface 包含 3 种不同系统模式：“DDI”、“LPI”和“LSI”以及不同的现场总线类型。通过许可证秘钥启用可能存在的系统模式和现场总线类型。通过该功能更新许可证。

1. 点击“Select license file”旁的“Browse”。
2. 在选择窗口中选择文件的存储位置。
3. 选择文件。
4. 在选择窗口中点击“打开”。
5. 点击“Save”。

► 加载许可证。

► 许可证加载完毕后显示信号“License is updated successfully”。

7.3 Vibration Sample



现有振动传感器随时记录水泵的振动情况。通过 Vibration Sample 可以将所记录的数据保存在 wav 文件中。

→ Channel
选择需要进行记录的传感器。
工厂设定：Internal X/Y
输入：

- Internal X/Y：DDI 中的振动传感器 X/Y
- Internal Z：DDI 中的振动传感器 Z
- Extern X/Y：输入端 1 或 2 上的外部振动传感器

→ Gain
将所记录的信号放大到约 60 dB。
工厂设定：0 %
输入：0...100 %（相当于 0...59.5 dB）
计算示例：

- 放大：系数 2
- 计算：$20\log_{10}(2) = 6.02$ dB
- 待设置的数值：10 (= 10 %)

→ Sample Rate
工厂设定：8000 Hz
输入：8000 Hz，16000 Hz，44100 Hz

→ Format
工厂设定：S16_LE (Signed 16 Bit Little Endian)

→ Channel Count
选择需要进行记录的通道。
工厂设定：1
输入：1（内部 X/内部 Z/内部 1），2（内部 X 和 Y/内部 1 和 2）

→ Duration
记录持续时间
工厂设定：1 s
输入：1...5 s

点击“Generate Sample”开始测量。

7.4 文件

可能显示以下信息：
→ Typeplate Data
显示技术数据。

→ Instruction Manual
PDF 格式的安装及操作说明。

→ Hydraulic Data
PDF 格式的检测记录。

通过“Regular user”用户帐号另外提供维护和安装日志：
→ Maintenance Logbook
记录各项维护作业的自由文本框。

→ Installation Logbook
有关安装说明的自由文本框。在首页上显示“Name of the installation site”。

注意！ 遵守数据保护！在维护和安装日志中不得记录个人相关数据。

7.5 许可证

所有所使用许可证和相应版本的概览（主菜单“License”）。

8 故障、原因和排除方法

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。

8.1 故障类型

Digital Data Interface 有五种不同的警报和警告信息优先级：
→ Alert Type A
→ Alert Type B
→ Warning Type C
→ Warning Type D
→ Message Type I

注意！ 警报和警告的功能原理取决于相应系统模式！

8.1.1 故障类型：系统模式 DDI 和 LPI

不同警报和警告信息的功能原理：
→ Alert Type A：在出现故障时关闭水泵。手动重置警报信息：
– 首页上的“Reset Error”
– 变频器或 I/O 模块的数字输入端上的“Reset”功能
– 通过现场总线传输的相应信号
→ Alert Type B：在出现故障时关闭水泵。如果排除了故障，将自动复位警报信息。
→ Warning Type C：这些警告可能接通变频器或 I/O 模块的继电器输出端。
→ Warning Type D：仅显示和记录这些警告。
→ Message Type I：有关运行状态的信息。

8.1.2 故障类型：系统模式 LSI

不同警报和警告信息的功能原理：
→ Alert Type A：在出现故障时不关闭水泵。手动重置警报信息：
– Master 首页上的“Master Reset”
– I/O 模块数字输入端上的“Reset”功能
– 通过现场总线传输的相应信号
→ Alert Type B：在出现故障时不关闭水泵。如果排除了故障，将自动复位警报信息。

注意！ 始终可通过干转保护关闭水泵！

→ Warning Type C：这些警告可能接通 **I/O 模块**的继电器输出端。
→ Warning Type D：仅显示和记录这些警告。
→ Message Type I：有关运行状态的信息。

8.2 故障代码

代码	型号	故障	原因	排除方法
100.x	A	Pump Unit Offline (SERIAL NUMBER)	无法与指定水泵建立连接。	检查网络连接。 检查网络设置。
101	A	Master Changed (SERIAL NUMBER)	基于预定义的更换策略或通讯故障而更换了水泵 Master。	在 Master 设置中检查更换策略。 检查网络连接。
200	B	Alarm in Pump (SERIAL NUMBER)	所指定水泵的警报。	检查所指定水泵的故障日志。
201	B	Dry Run	已达到空运行水位	检查系统的运行参数。 检查液位设置。 检查数字输入端的设置。
202	B	High Water	高水位已达到	检查系统的运行参数。 检查液位设置。 检查数字输入端的设置。
203	B	Sensor Error	测量值超出测量范围，传感器损坏。	通知客户服务部。
400	C	Warning in Pump (SERIAL NUMBER)	所指定水泵的警告。	检查所指定水泵的故障日志。
500	D	Pipe Sedimentation High	管路堵塞。检测到堵塞后，在下一个泵送循环以最高频率启动冲洗。 超过允许的比率 (Admissible Flow Ratio for Sedimentation) 时结束冲洗。	检查管路，清除堵塞。 检查设置“High Efficiency(HE) Controller”。
501	D	Comm. Error I/O Extension	与 I/O 模块的通讯失败。	检查网络连接。 检查 I/O 模块。 在 Master 设置中检查 I/O 模块的设置。
900	I	More than 4 Pumps in System	超过系统中的最大水泵数量。	系统中最多集成 4 个水泵。
901	I	Pump removed from System (SERIAL NUMBER)	从系统中取出多余的水泵。	检查网络连接。
902	I	Pipe Measurement Incomplete	未成功执行管路参数计算。	检查 High Efficiency(HE) Controller/Pipe Settings 下的设置并重新计算。 如果继续显示相应信号，则联系客户服务部。
903	I	Pipe Calculation Timeout	管路参数计算由于超时而中断。	检查 High Efficiency(HE) Controller/Pipe Settings 下的设置并重新计算。 如果继续显示相应信号，则联系客户服务部。
904	I	Pipe Settings / Calculation Missing	尚未执行管路参数计算。无法激活 HE 控制器。	在 High Efficiency(HE) Controller/Pipe Settings 下输入设置并开始计算。
1000	A	Motor Safe Stop Alarm	“Safe Torque Off”已激活。	检查接口：在变频器端子 37 上必须有 24 VDC 电压。如果排除了故障，必须进行手动复位！ 在潜在爆炸环境内安装：检查关闭参数（电机过热保护、干转保护）。
1001	A	Motor Ground Fault Alarm	输出相位和地线之间的接地（在变频器和电机之间或者在电机中）	请专业电工检查变频器上的电气连接。 请专业电工检查电机上的电气连接。
1002	A	Motor Short Circuit Alarm	电机内或电机接口上短路	请专业电工检查电机上的电气连接。

代码	型号	故障	原因	排除方法
2000	B	Motor Vibration X – Trip	已超过振动极限值。	检查水泵和安装（比如不平稳运行、工况点差、紧绷安装）。 检查并在必要时修正 Digital Data Interface 中的振动极限值。
2001	B	Motor Vibration Y – Trip	已超过振动极限值。	检查水泵和安装（比如不平稳运行、工况点差、紧绷安装）。 检查并在必要时修正 Digital Data Interface 中的振动极限值。
2002	B	Motor Vibration Z – Trip	已超过振动极限值。	检查水泵和安装（比如不平稳运行、工况点差、紧绷安装）。 检查并在必要时修正 Digital Data Interface 中的振动极限值。
2003	B	Vibration Input 1 – Trip	已超过振动极限值。	检查水泵和安装（比如不平稳运行、工况点差、紧绷安装）。 检查并在必要时修正 Digital Data Interface 中的振动极限值。
2004	B	Vibration Input 2 – Trip	已超过振动极限值。	检查水泵和安装（比如不平稳运行、工况点差、紧绷安装）。 检查并在必要时修正 Digital Data Interface 中的振动极限值。
2005	B	FC Overload Alarm	功率卡的温度传感器探测到过高或过低的温度。	检查变频器的通风。
2005	B	FC Overload Alarm	达到控制卡的关闭温度 (75 °C)。	检查变频器的通风。
2005	B	FC Overload Alarm	逆变器过载	比较额定电流： – 将 LCP 上显示的输出电流与变频器上的额定电流进行比较 – 将 LCP 上显示的输出电流与测得的电机电流进行比较 在 LCP 上显示热载荷，监控数值： – 如果变频器超出持续额定电流运行，则计数器值提高。 – 如果变频器低于持续额定电流运行，则计数器值降低。
2006	B	FC Line Alarm	电源连接：缺少一个相位	请专业电工检查变频器上的电气连接。 请专业电工检查电机上的电气连接。
2006	B	FC Line Alarm	电源连接：相位不对称度过高	请专业电工检查变频器上的电气连接。 请专业电工检查电机上的电气连接。
2006	B	FC Line Alarm	电机连接：缺少一个相位	请专业电工检查变频器上的电气连接。 请专业电工检查电机上的电气连接。
2007	B	FC DC Circuit Alarm	过电压	延长制动斜坡的斜坡时间。
2007	B	FC DC Circuit Alarm	低电压	请专业电工检查变频器上的电气连接。 检查预充电电路。
2008	B	FC Supply Alarm	在变频器上没有电源电压	请专业电工检查变频器上的电气连接。
2008	B	FC Supply Alarm	外部 24 VDC 供电过载	请专业电工检查变频器上的电气连接。
2008	B	FC Supply Alarm	控制卡的 1.8 VDC 供电在公差范围以外。	请专业电工检查变频器上的电气连接。
3000	A/B	Dry Run Detected	蓄水罐中的液位达到临界液位。	检查安装（比如入口、出口、液位设置）。 检查数字输入端的设置。
3001	A/B	Leakage Input Alarm	识别到泄漏	检查外部电极（可选）的功能。 执行密封室换油。 检查数字输入端的设置。

代码	型号	故障	原因	排除方法
3002	A/B	Temp. Sensor 1 Trip	达到绕组温度极限值	检查电机是否过载。 检查电机冷却装置。 检查并在必要时修正 Digital Data Interface 中的温度极限值。
3003	A/B	Temp. Sensor 2 Trip	达到绕组温度极限值	检查电机是否过载。 检查电机冷却装置。 检查并在必要时修正 Digital Data Interface 中的温度极限值。
3004	A/B	Temp. Sensor 3 Trip	达到绕组温度极限值	检查电机是否过载。 检查电机冷却装置。 检查并在必要时修正 Digital Data Interface 中的温度极限值。
3005	A/B	Temp. Sensor 4 Trip	达到轴承温度极限值	在干式地坑安装时：检查环境温度，遵守最大值。 检查并在必要时修正 Digital Data Interface 中的温度极限值。
3006	A/B	Temp. Sensor 5 Trip	达到轴承温度极限值	在干式地坑安装时：检查环境温度，遵守最大值。 检查并在必要时修正 Digital Data Interface 中的温度极限值。
3007	A/B	Motor Overload	达到扭矩极限	如果系统在启动斜坡中超过电机扭矩极限，则延长启动斜坡时间。 如果系统在制动斜坡中超过发电机扭矩极限，则延长制动斜坡时间。 如果在运行中达到扭矩极限，则提高扭矩极限。确保系统可以以更高的扭矩运行，必要时通知客户服务部。 电机的耗电过高，检查使用条件。
3007	A/B	Motor Overload	过电流	将电机与电源连接断开，手动旋转轴。如果无法旋转轴，则通知客户服务部。 检查电机功率/变频器配置。如果电机功率过高，则通知客户服务部。 检查变频器中参数 1-20 至 1-25 中的电机数据是否正确，必要时调整。
3008	A/B	Motor Overtemp.	电机过热保护被触发。	电机过热，检查冷却装置和使用条件。 检查电机是否机械过载。 检查电机过热保护连接（变频器：端子 33 和端子 50 (+10 VDC)。 如果使用热敏开关或热变电阻器，则检查变频器中的参数 1-93“Thermistor Source”：该值必须与传感器布线相符。
4000	C	High Water Detected	蓄水罐中的液位达到临界液位。	检查安装（比如入口、出口、液位设置）。 检查数字输入端的设置。
4001	C	Leakage Input Warning	识别到泄漏	检查外部电极（可选）的功能。 执行密封室换油。 检查数字输入端的设置。
4002	C	Temp. Sensor 1 Fault	传感器损坏，测量值在测量范围以外。	通知客户服务部。
4003	C	Temp. Sensor 2 Fault	传感器损坏，测量值在测量范围以外。	通知客户服务部。
4004	C	Temp. Sensor 3 Fault	传感器损坏，测量值在测量范围以外。	通知客户服务部。
4005	C	Temp. Sensor 4 Fault	传感器损坏，测量值在测量范围以外。	通知客户服务部。

代码	型号	故障	原因	排除方法
4006	C	Temp. Sensor 5 Fault	传感器损坏，测量值在测量范围以外。	通知客户服务部。
4007	C	Internal Vibration Sensor Fault	传感器损坏，测量值在测量范围以外。	通知客户服务部。
4008	C	Current Sensor 1 Fault	传感器损坏，测量值在测量范围以外。	通知客户服务部。
4009	C	Current Sensor 2 Fault	传感器损坏，测量值在测量范围以外。	通知客户服务部。
4010	C	Onboard Temp. Sensor Fault	传感器损坏，测量值在测量范围以外。	通知客户服务部。
4011	C	Temp. Sensor 1 Warning	达到绕组温度极限值。	检查电机是否过载。 检查电机冷却装置。 检查并在必要时修正 Digital Data Interface 中的温度极限值。
4012	C	Temp. Sensor 2 Warning	达到绕组温度极限值。	检查电机是否过载。 检查电机冷却装置。 检查并在必要时修正 Digital Data Interface 中的温度极限值。
4013	C	Temp. Sensor 3 Warning	达到绕组温度极限值。	检查电机是否过载。 检查电机冷却装置。 检查并在必要时修正 Digital Data Interface 中的温度极限值。
4014	C	Temp. Sensor 4 Warning	达到轴承温度极限值。	在干式地坑安装时：检查环境温度，遵守最大值。 检查并在必要时修正 Digital Data Interface 中的温度极限值。
4015	C	Temp. Sensor 5 Warning	达到轴承温度极限值。	在干式地坑安装时：检查环境温度，遵守最大值。 检查并在必要时修正 Digital Data Interface 中的温度极限值。
4016	C	Temp. On Board Warning	在 Digital Data Interface 中达到温度极限值。	检查电机是否过载。 检查电机冷却装置。
4017	C	General FC Alarm	变频器“端子 50”：电压 <10 V	移除端子 50 上的电缆： – 如果变频器不再显示警告，说明存在与客户方面布线有关的问题。 – 如果变频器继续显示警告，则更换控制卡。
4017	C	General FC Alarm	在变频器输出端上未连接电机。	连接电机。
4017	C	General FC Alarm	电机过载	电机过热，检查冷却装置和使用条件。 检查电机是否机械过载。
4017	C	General FC Alarm	达到转速极限。	检查使用条件。
4017	C	General FC Alarm	达到电压极限。	检查使用条件。
4017	C	General FC Alarm	变频器的温度过低，无法运行。	检查变频器中的温度传感器。 检查 IGBT 和门电路控制卡之间的传感器电缆。
4018	C	Motor Ground Fault Warning	输出相位和地线之间的接地（在变频器和电机之间或者在电机中）	请专业电工检查变频器上的电气连接。 请专业电工检查电机上的电气连接。
4019	C	Motor Overload	达到扭矩极限	如果系统在启动斜坡中超过电机扭矩极限，则延长启动斜坡时间。 如果系统在制动斜坡中超过发电机扭矩极限，则延长制动斜坡时间。 如果在运行中达到扭矩极限，则提高扭矩极限。确保系统可以以更高的扭矩运行，必要时通知客户服务部。 电机的耗电过高，检查使用条件。

代码	型号	故障	原因	排除方法
4019	C	Motor Overload	过电流	将电机与电源连接断开，手动旋转轴。如果无法旋转轴，则通知客户服务部。 检查电机功率/变频器配置。如果电机功率过高，则通知客户服务部。 检查变频器中参数 1-20 至 1-25 中的电机数据是否正确，必要时调整。
4020	C	Motor Overtemp.	电机过热保护被触发。	电机过热，检查冷却装置和使用条件。 检查电机是否机械过载。 检查电机过热保护连接（变频器：端子 33 和端子 50 (+10 VDC)。 如果使用热敏开关或热变电阻器，则检查变频器中的参数 1-93“Thermistor Source”：该值必须与传感器布线相符。
4022	C	Motor Safe Stop Warning	“Safe Torque Off”已激活。	检查接口：在变频器端子 37 上必须有 24 VDC 电压。如果排除了故障，必须进行手动复位！ 在潜在爆炸环境内安装：检查关闭参数（电机过热保护、干转保护）。
4024	C	FC Overload Warning	功率卡的温度传感器探测到过高或过低的温度。	检查变频器的通风。
4024	C	FC Overload Warning	达到控制卡的关闭温度 (75 °C)。	检查变频器的通风。
4024	C	FC Overload Warning	逆变器过载	比较额定电流： - 将 LCP 上显示的输出电流与变频器上的额定电流进行比较 - 将 LCP 上显示的输出电流与测得的电机电流进行比较 在 LCP 上显示热载荷，监控数值： - 如果变频器超出持续额定电流运行，则计数器值提高。 - 如果变频器低于持续额定电流运行，则计数器值降低。 检查变频器中参数 1-20 至 1-25 中的电机数据是否正确，必要时调整。
4025	C	FC Line Warning	电源连接：缺少一个相位	请专业电工检查变频器上的电气连接。 请专业电工检查电机上的电气连接。
4025	C	FC Line Warning	电源连接：相位不对称度过高	请专业电工检查变频器上的电气连接。 请专业电工检查电机上的电气连接。
4025	C	FC Line Warning	电机连接：缺少一个相位	请专业电工检查变频器上的电气连接。 请专业电工检查电机上的电气连接。
4026	C	FC DC Circuit Warning	过电压	延长制动斜坡的斜坡时间。
4026	C	FC DC Circuit Warning	低电压	请专业电工检查变频器上的电气连接。 检查预充电电路。
4027	C	FC Supply Warning	在变频器上没有电源电压	请专业电工检查变频器上的电气连接。
4027	C	FC Supply Warning	外部 24 VDC 供电过载	请专业电工检查变频器上的电气连接。
4027	C	FC Supply Warning	控制卡的 1.8 VDC 供电在公差范围以外。	请专业电工检查变频器上的电气连接。
4028	C	FC Communication Warning	控制字超时	检查 Ethernet 接口。 提高变频器中参数 8-03“Control Timeout Time”。 检查通讯设备的功能。 检查布线是否按照电磁兼容性要求安装。
4029	C	General FC Warning	变频器“端子 50”：电压 <10 V	移除“端子 50”上的电缆： - 如果变频器不再显示警告，说明存在与客户方面布线有关的问题。 - 如果变频器继续显示警告，则更换控制卡。
4029	C	General FC Warning	在变频器输出端上未连接电机。	连接电机。

代码	型号	故障	原因	排除方法
4029	C	General FC Warning	电机过载	电机过热，检查冷却装置和使用条件。 检查电机是否机械过载。
4029	C	General FC Warning	达到转速极限。	检查使用条件。
4029	C	General FC Warning	达到电压极限。	检查使用条件。
4029	C	General FC Warning	变频器的温度过低，无法运行。	检查变频器中的温度传感器。 检查 IGBT 和门电路控制卡之间的传感器电缆。
4030	C	EXIO Communication Down	与 I/O 模块的通讯失败。	检查 Digital Data Interface 中 I/P 模块的设置。 检查 I/O 模块中的设置。 检查 Ethernet 接口。
4031	C	FC Communication Down	与变频器的通讯失败。	检查 Digital Data Interface 中变频器的设置。 检查变频器中的设置。 检查 Ethernet 接口。
4034	C	Leakage Detected 1	在泄漏腔内识别到泄漏。	泄漏腔排水。
4035	C	Leakage Detected 2	识别到密封室中泄漏。	执行密封室换油。
5000	D	Clog Detection Teach Failure	示教过程未结束： – 水泵在示教过程中切换为手动模式或者停止。 – 超时，因为未达到额定频率。	检查水泵是否堵塞。 确保在补水罐中有充足的液位。 检查 Digital Data Interface 中示教过程的设置。
6000	C/D	Emerged Operation – Limit Temperature	达到设置的温度极限值。	检查 Digital Data Interface 中“非浸入运行”功能的设置。
6001	C/D	Clog Detection	水力部件中可能存在沉积物	激活“清洁序列”功能。
6002	C/D	Motor Vibration X – Warning	已超过振动极限值。	检查水泵和安装（比如不平稳运行、工况点差、紧绷安装）。 检查并在必要时修正 Digital Data Interface 中的振动极限值。
6003	C/D	Motor Vibration Y – Warning	已超过振动极限值。	检查水泵和安装（比如不平稳运行、工况点差、紧绷安装）。 检查并在必要时修正 Digital Data Interface 中的振动极限值。
6004	C/D	Motor Vibration Z – Warning	已超过振动极限值。	检查水泵和安装（比如不平稳运行、工况点差、紧绷安装）。 检查并在必要时修正 Digital Data Interface 中的振动极限值。
6005	C/D	Vibration Input 1 – Warning	已超过振动极限值。	检查水泵和安装（比如不平稳运行、工况点差、紧绷安装）。 检查并在必要时修正 Digital Data Interface 中的振动极限值。
6006	C/D	Vibration Input 2 – Warning	已超过振动极限值。	检查水泵和安装（比如不平稳运行、工况点差、紧绷安装）。 检查并在必要时修正 Digital Data Interface 中的振动极限值。
8001	D	Auto Setup Failed	无法结束自动参数设置。	变频器处于“停止”位置。 检查 Digital Data Interface 中变频器的设置，再次启动自动参数设置。
8002	D	Auto Setup Timed Out	超出 2 分钟的时限。	变频器处于“停止”位置。 检查 Digital Data Interface 中变频器的设置，再次启动自动参数设置。
10004	I	Pump Kick is Running	水泵超出允许的休止状态时间。	
10005	I	Cleaning-Cycle is Running	清洁序列正在运行： – 在每次泵送过程之前 – 识别到堵塞	
10006	I	Teach was Successful	堵塞识别的示教过程结束。	
10007	I	Update Succeeded	升级结束。	

代码	型号	故障	原因	排除方法
10008	I	Update Failed	无法结束升级。	通知客户服务部。

9 附录

9.1 现场总线：参数概览

下文列出了现场总线类型 Modbus TCP 和 OPC UA 的各个现场总线的参数。

注意！ 在单独的表格中列出了各种现场总线类型的 LSI 主机参数！

注意！ 现场总线"ModBus TCP"的从机编号：255，Port：502！

***DDI*、*LPI* 和 *LSI (Slave)* 系统模式下各个参数组的说明**

→ 参数组 Status
包含有关运行状态、警告和警报的信息。

→ 参数组 Motor Information
包含有关电机额定值的信息、电机和水力部件类型、水泵序号以及最低和最高频率。

→ 参数组 Sensor Locations/Types
包含有关传感器类型（温度、电流和振动）及其安装的信息。

→ 参数组 Data Readouts
包含当前传感器值、运行小时数、泵送和清洁循环数以及水泵的能耗。

→ 参数组 Time
包含有关日期和时间的信息。

→ 参数组 Control Word
包含针对水泵运行模式、额定频率、斜坡时间、水泵启用和水泵功能的设置。

→ 参数组 Sensor Trip/Warning
包含温度和振动传感器的阈值设置。

***LSI (Master)* 系统模式下各个参数组的说明**

→ 参数组 System Variables
包含有关系统运行状态、系统警告和系统警报的信息。

→ 参数组 Analog Variables
包含液位、压力和流量的当前数值以及系统中正在运行的水泵的频率和数量。

→ 参数组 Data Time Variables
包含有关日期和时间的信息。

→ 参数组 Pump 1 ... Pump 4
包含各个水泵的信息：序号、电机和水力部件类型、状态、警告、警报、当前功率、运行小时数、泵送和清洁循环的数量、千瓦时计数器。

→ 参数组 Control Word
包含针对 PID 控制、蓄水罐排水和备选启动水位的启用。

→ 参数组 Modes
包含自动模式下系统运行模式和调控模式的设置。

→ 参数组 PID Setpoint
包含 PID 额定值的设置。

另请参见

- ModBus TCP: DDI/LPI/LSI Slave-Parameter [▶ 70]
- OPC-UA: DDI/LPI/LSI Slave-Parameter [▶ 75]
- ModBus TCP: LSI Master-Parameter [▶ 80]
- OPC-UA: LSI Master-Parameter [▶ 84]

9.1.1 ModBus TCP: DDI/LPI/LSI Slave-Parameter

Group	Symbol	Register Type	Address in DDI	Address in LPI	Address in LSI	Size	Data Type	Scaling	Bit	Bit-Function	Description
Status	MB_Status_Word	Input Registers	0	0	0	1	UINT	Bitfield	0	Run	
									1	Rising_Water_Level	
									2	Falling_Water_Level	
									3	External_Off	
									4	Pump_Kick_Running	
									5	Anticlog_Running	
									6		
									7		
									8		
									9		
									10		
									11		
									12	Warning_TypeD_Active	only in LSI available
									13	Warning_TypeC_Active	only in LSI available
									14	Err_TypeB_Active	only in LSI available
									15	Err_TypeA_Active	only in LSI available
Status	MS_Warning_Word_MSB	Input Registers	1	1	1	2	DWORD (High - Low)	Bitfield	0	Comm_Error_Fieldbus_OPCUA	
									1	Thermostat_Mode_Limit_temperature	
									2	Clog_Detection	
									3	Vibration_X_warning	
									4	Vibration_Y_warning	
									5	Vibration_Z_warning	
									6	Vibration_1_warning	
									7	Vibration_2_warning	
Status	MS_Warning_Word_LSB	Input Registers	3	3	3	2	DWORD (High - Low)	Bitfield	0	High_Water_detected	
									1	Leackage_input	
									2	Temp_1_fault	
									3	Temp_2_fault	
									4	Temp_3_fault	
									5	Temp_4_fault	
									6	Temp_5_fault	
									7	Internal_Vibration_fault	
									8	Current_Input_1_fault	
									9	Current_Input_2_fault	
									10	Onboard_Temp_fault	
									11	Temp_1	
									12	Temp_2	
									13	Temp_3	
									14	Temp_4	
									15	Temp_5	
									16	Onboard_Temp	
									17	AMA_not_OK	
									18	General_FC	
									19	Motor_Ground_Fault	
									20	Motor_Overload	
									21	Motor_Overtemp	
									22	Motor_Short	

Group	Symbol	Register Type	Address in DDI	Address in LPI	Address in LSI	Size	Data Type	Scaling	Bit	Bit-Function	Description
									23	Safe_Stop	
									24	FC_Overload	
									25	FC_Line	
									26	FC_DC_Circuit	
									27	FC_Supply	
									28	FC_Communication	
									29	Comm_Error_IO_Extension	
									30	Comm_Error_FC	
									31	Comm_Error_Fieldbus_Modbus_Slave	
Status	MS_Alarm_Word_MSB	Input Registers	5	5	5	2	DWORD (High - Low)	Bltfield			no content
Status	MS_Alarm_Word_LSB	Input Registers	7	7	7	2	DWORD (High - Low)	Bitfield	0	Motor_Ground_Fault	
									1	Motor_Short	
									2	Safe_Stop	
									3	Vibration_X_trip	
									4	Vibration_Y_trip	
									5	Vibration_Z_trip	
									6	Vibration_1_trip	
									7	Vibration_2_trip	
									8	FC_Overload	
									9	FC_Line	
									10	FC_DC_Circuit	
									11	FC_Supply	
									12	Dry_Run_detected	
									13	Leackage_input_alarm	
									14	Temp_Sensor_1_trip	
									15	Temp_Sensor_2_trip	
									16	Temp_Sensor_3_trip	
									17	Temp_Sensor_4_trip	
									18	Temp_Sensor_5_trip	
									19	Motor_Overload	
									20	Motor_Overtemp	
									21	General_FC	
									22	FC_Communication	
									23	AMA_Not_OK	
Motor Information	NP_Serial_Number	Input Registers	1000	1000	1000	8	String(16)	-			
Motor Information	NP_Motor_Type	Input Registers	1008	1008	1008	16	String(32)	-			
Motor Information	NP_Pump_Type	Input Registers	1024	1024	1024	16	String(32)	-			
Motor Information	NP_Nominal_Pwr	Input Registers	1040	1040	1040	2	FLOAT32 (High - Low)	-			
Motor Information	NP_Nominal_Volt	Input Registers	1042	1042	1042	2	FLOAT32 (High - Low)	-			
Motor Information	NP_Nominal_Curr	Input Registers	1044	1044	1044	2	FLOAT32 (High - Low)	-			
Motor Information	NP_Nominal_Freq	Input Registers	1046	1046	1046	2	FLOAT32 (High - Low)	-			
Motor Information	NP_Max_St_Per_Hour	Input Registers	1048	1048	1048	2	FLOAT32 (High - Low)	-			
Motor Information	NP_Max_Freq	Input Registers	1050	1050	1050	2	FLOAT32 (High - Low)	-			
Motor Information	NP_Min_Freq	Input Registers	1052	1052	1052	2	FLOAT32 (High - Low)	-			
Sensor Locations/Types	SI_Temperature[1].Location	Input Registers	2000	2000	2000	1	UINT	ENUM			0=unused / 1=winding_top / 2=winding_bottom / 3=bearing_top / 4=bearing_bottom / 5=cooling_liquid / 6=motor_laminations

Group	Symbol	Register Type	Address in DDI	Address in LPI	Address in LSI	Size	Data Type	Scaling	Bit	Bit-Function	Description
Sensor Locations/Types	SI_Temperature[2].Location	Input Registers	2001	2001	2001	1	UINT	ENUM			0=unused / 1=winding_top / 2=winding_bottom / 3=bearing_top / 4=bearing_bottom / 5=cooling_liquid / 6=motor_laminations
Sensor Locations/Types	SI_Temperature[3].Location	Input Registers	2002	2002	2002	1	UINT	ENUM			0=unused / 1=winding_top / 2=winding_bottom / 3=bearing_top / 4=bearing_bottom / 5=cooling_liquid / 6=motor_laminations
Sensor Locations/Types	SI_Temperature[4].Location	Input Registers	2003	2003	2003	1	UINT	ENUM			0=unused / 1=winding_top / 2=winding_bottom / 3=bearing_top / 4=bearing_bottom / 5=cooling_liquid / 6=motor_laminations
Sensor Locations/Types	SI_Temperature[5].Location	Input Registers	2004	2004	2004	1	UINT	ENUM			0=unused / 1=winding_top / 2=winding_bottom / 3=bearing_top / 4=bearing_bottom / 5=cooling_liquid / 6=motor_laminations
Sensor Locations/Types	SI_VibrationExtern1.Location	Input Registers	2005	2005	2005	1	UINT	ENUM			0=unused / 1=motor_hut_x / 2=motor_hut_y / 3=bearing_top_x / 4=bearing_ top_y / 5=bearing_bottom_x / 6=bearing_bottom_y
Sensor Locations/Types	SI_VibrationExtern2.Location	Input Registers	2006	2006	2006	1	UINT	ENUM			0=unused / 1=motor_hut_x / 2=motor_hut_y / 3=bearing_top_x / 4=bearing_ top_y / 5=bearing_bottom_x / 6=bearing_bottom_y
Sensor Locations/Types	SI_Current[0].Sensor_Type	Input Registers	2007	2007	2007	1	UINT	ENUM			0=unused / 1=current_signal_only / 2=leackage_ switch / 3=sealing_CLP_V01 / 4=leackage_CLP_V01
Sensor Locations/Types	SI_Current[1].Sensor_Type	Input Registers	2008	2008	2008	1	UINT	ENUM			0=unused / 1=current_signal_only / 2=leackage_ switch / 3=sealing_CLP_V01 / 4=leackage_CLP_V02
Data Readouts	IO_Temperature[1].Value	Input Registers	3000	3000	3000	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_Temperature[2].Value	Input Registers	3002	3002	3002	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_Temperature[3].Value	Input Registers	3004	3004	3004	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_Temperature[4].Value	Input Registers	3006	3006	3006	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_Temperature[5].Value	Input Registers	3008	3008	3008	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_Temperature[0].Value	Input Registers	3010	3010	3010	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_Current[0].Value	Input Registers	3012	3012	3012	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_Current[1].Value	Input Registers	3014	3014	3014	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_Vibration[0].Value	Input Registers	3016	3016	3016	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_Vibration[1].Value	Input Registers	3018	3018	3018	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_Vibration[2].Value	Input Registers	3020	3020	3020	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_Vibration[3].Value	Input Registers	3022	3022	3022	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_Vibration[4].Value	Input Registers	3024	3024	3024	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_FC_Power.Value	Input Registers	-	3026	3026	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_FC_Voltage.Value	Input Registers	-	3028	3028	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_FC_Current.Value	Input Registers	-	3030	3030	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_FC_Frequency.Value	Input Registers	-	3032	3032	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_Level.Value	Input Registers	3026	3034	3034	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_Pressure.Value	Input Registers	3028	3036	3036	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_Flow.Value	Input Registers	3030	3038	3038	2	FLOAT32 (High - Low)	-			
Data Readouts	RT_RUNNING_TIME_RTN	Input Registers	3032	3040	3040	2	DWORD (High - Low)	1			
Data Readouts	RT_PUMP_CYCLE_CNT_RTN	Input Registers	3034	3042	3042	2	DWORD (High - Low)	1			
Data Readouts	RT_CLEANING_CYCLE_CNT_RTN	Input Registers	-	3044	3044	2	DWORD (High - Low)	1			
Data Readouts	RT_ENERGY_CONSUMPTION	Input Registers	-	3046	3046	2	DWORD (High - Low)	1			
Time	RI_System_Current_Year	Input Registers	4000	4000	4000	1	UINT	1			
Time	RI_System_Current_Month	Input Registers	4001	4001	4001	1	UINT	1			
Time	RI_System_Current_Day	Input Registers	4002	4002	4002	1	UINT	1			
Time	RI_System_Current_Hour	Input Registers	4003	4003	4003	1	UINT	1			
Time	RI_System_Current_Minute	Input Registers	4004	4004	4004	1	UINT	1			

Group	Symbol	Register Type	Address in DDI	Address in LPI	Address in LSI	Size	Data Type	Scaling	Bit	Bit-Function	Description
Time	RI_System_Current_Second	Input Registers	4005	4005	4005	1	UINT	1			
Time	RI_System_Uptime	Input Registers	4006	4006	4006	2	DWORD (High - Low)	1			
Time	RI_System_Current_Ms	Input Registers	4008	4008	4008	2	DWORD (High - Low)	1			
Control Word	MB_Control_Word	Holding Registers	0	0	0	1	UINT	Bitfield	0	Reset	
									1	Start	Applies only for LPI
									2		
									3		
									4		
									5		
									6		
									7		
									8		
									9		
									10		
									11		
									12		
									13		
									14		
									15	Save_Config	Rising edge of this Bit is needed after changing a parameter of the group *Control Word*. This is not applicable for *Reset, Start and MB_Bus_Control_Value*
Control Word	MB_Bus_Control_Value	Holding Registers	-	1	1	1	UINT	100			
Control Word	MB_Operation_Mode	Holding Registers	-	2	2	1	UINT	ENUM			0=manual / 1=auto / 2=off
Control Word	MB_Manual_Frequency	Holding Registers	-	3	3	1	UINT	100			
Control Word	MB_FC_Ramp_Up_Time	Holding Registers	-	4	4	1	UINT	100			
Control Word	MB_FC_Ramp_Down_Time	Holding Registers	-	5	5	1	UINT	100			
Control Word	MB_Enable_Pump_Kick	Holding Registers	-	7	7	1	UINT	ENUM			0=off / 1=on
Control Word	MB_Enable_Thermostat_Mode	Holding Registers	-	6	6	1	UINT	ENUM			0=off / 1=on
Control Word	MB_Allow_Anticlog	Holding Registers	-	8	8	1	UINT	ENUM			0=off / 1=on
Sensor Trip/Warning	MB_Temp_Sensors[0].Warning	Holding Registers	1000	1000	1000	1	UINT	10			
Sensor Trip/Warning	MB_Temp_Sensors[0].Trip	Holding Registers	1001	1001	1001	1	UINT	10			
Sensor Trip/Warning	MB_Temp_Sensors[1].Warning	Holding Registers	1002	1002	1002	1	UINT	10			
Sensor Trip/Warning	MB_Temp_Sensors[1].Trip	Holding Registers	1003	1003	1003	1	UINT	10			
Sensor Trip/Warning	MB_Temp_Sensors[2].Warning	Holding Registers	1004	1004	1004	1	UINT	10			
Sensor Trip/Warning	MB_Temp_Sensors[2].Trip	Holding Registers	1005	1005	1005	1	UINT	10			
Sensor Trip/Warning	MB_Temp_Sensors[3].Warning	Holding Registers	1006	1006	1006	1	UINT	10			
Sensor Trip/Warning	MB_Temp_Sensors[3].Trip	Holding Registers	1007	1007	1007	1	UINT	10			
Sensor Trip/Warning	MB_Temp_Sensors[4].Warning	Holding Registers	1008	1008	1008	1	UINT	10			
Sensor Trip/Warning	MB_Temp_Sensors[4].Trip	Holding Registers	1009	1009	1009	1	UINT	10			
Sensor Trip/Warning	MB_Vib_Sensors[0].Warning	Holding Registers	1010	1010	1010	1	UINT	10			
Sensor Trip/Warning	MB_Vib_Sensors[0].Trip	Holding Registers	1011	1011	1011	1	UINT	10			
Sensor Trip/Warning	MB_Vib_Sensors[1].Warning	Holding Registers	1012	1012	1012	1	UINT	10			
Sensor Trip/Warning	MB_Vib_Sensors[1].Trip	Holding Registers	1013	1013	1013	1	UINT	10			
Sensor Trip/Warning	MB_Vib_Sensors[2].Warning	Holding Registers	1014	1014	1014	1	UINT	10			
Sensor Trip/Warning	MB_Vib_Sensors[2].Trip	Holding Registers	1015	1015	1015	1	UINT	10			
Sensor Trip/Warning	MB_Vib_Sensors[3].Warning	Holding Registers	1016	1016	1016	1	UINT	10			
Sensor Trip/Warning	MB_Vib_Sensors[3].Trip	Holding Registers	1017	1017	1017	1	UINT	10			
Sensor Trip/Warning	MB_Vib_Sensors[4].Warning	Holding Registers	1018	1018	1018	1	UINT	10			

Group	Symbol	Register Type	Address in DDI	Address in LPI	Address in LSI	Size	Data Type	Scaling	Bit	Bit-Function	Description
Sensor Trip/Warning	MB_Vib_Sensors[4].Trip	Holding Registers	1019	1019	1019	1	UINT	10			

9.1.2 OPC-UA: DDI/LPI/LSI Slave-Parameter

Group	Symbol	MODE	DDI	LPI	LSI	TYPE	Scaling	Bit	Bit-Function	Description
Status	Status_Word	read only	x	x	x	UINT16	Bitfield	0	Run	
								1	Rising_Water_Level	
								2	Falling_Water_Level	
								3	External_Off	
								4	Pump_Kick_Running	
								5	Anticlog_Running	
								6		
								7		
								8		
								9		
								10		
								11		
								12	Warning_TypeD_Active	only in LSI available
								13	Warning_TypeC_Active	only in LSI available
								14	Err_TypeB_Active	only in LSI available
								15	Err_TypeA_Active	only in LSI available
Status	Warning_Word_MSB	read only	x	x	x	UINT32	Bitfield	0	Comm_Error_Fieldbus_OPCUA	
								1	Thermostat_Mode_Limit_temperature	
								2	Clog_Detection	
								3	Vibration_X_warning	
								4	Vibration_Y_warning	
								5	Vibration_Z_warning	
								6	Vibration_1_warning	
								7	Vibration_2_warning	
Status	Warning_Word_LSB	read only	x	x	x	UINT32	Bitfield	0	High_Water_detected	
								1	Leackage_input	
								2	Temp_1_fault	
								3	Temp_2_fault	
								4	Temp_3_fault	
								5	Temp_4_fault	
								6	Temp_5_fault	
								7	Internal_Vibration_fault	
								8	Current_Input_1_fault	
								9	Current_Input_2_fault	
								10	Onboard_Temp_fault	
								11	Temp_1	
								12	Temp_2	
								13	Temp_3	
								14	Temp_4	
								15	Temp_5	
								16	Onboard_Temp	
								17	AMA_not_OK	
								18	General_FC	

Group	Symbol	MODE	DDI	LPI	LSI	TYPE	Scaling	Bit	Bit-Function	Description
								19	Motor_Ground_Fault	
								20	Motor_Overload	
								21	Motor_Overtemp	
								22	Motor_Short	
								23	Safe_Stop	
								24	FC_Overload	
								25	FC_Line	
								26	FC_DC_Circuit	
								27	FC_Supply	
								28	FC_Communication	
								29	Comm_Error_IO_Extension	
								30	Comm_Error_FC	
								31	Comm_Error_Fieldbus_Modbus_Slave	
Status	Alarm_Word_MSB	read only	x	x	x	UINT32	Bitfield			no content
Status	Alarm_Word_LSB	read only	x	x	x	UINT32	Bitfield	0	Motor_Ground_Fault	
								1	Motor_Short	
								2	Safe_Stop	
								3	Vibration_X_trip	
								4	Vibration_Y_trip	
								5	Vibration_Z_trip	
								6	Vibration_1_trip	
								7	Vibration_2_trip	
								8	FC_Overload	
								9	FC_Line	
								10	FC_DC_Circuit	
								11	FC_Supply	
								12	Dry_Run_detected	
								13	Leackage_input_alarm	
								14	Temp_Sensor_1_trip	
								15	Temp_Sensor_2_trip	
								16	Temp_Sensor_3_trip	
								17	Temp_Sensor_4_trip	
								18	Temp_Sensor_5_trip	
								19	Motor_Overload	
								20	Motor_Overtemp	
								21	General_FC	
								22	FC_Communication	
								23	AMA_Not_OK	
Motor Information	Serial_Number	read only	x	x	x	STRING256	-			
Motor Information	Motor Type	read only	x	x	x	STRING257	-			
Motor Information	Pump Type	read only	x	x	x	STRING258	-			
Motor Information	Nominal_Pwr	read only	x	x	x	FLOAT32 (High - Low)	-			
Motor Information	Nominal_Volt	read only	x	x	x	FLOAT32 (High - Low)	-			

Group	Symbol	MODE	DDI	LPI	LSI	TYPE	Scaling	Bit	Bit-Function	Description
Motor Information	Nominal_Curr	read only	x	x	x	FLOAT32 (High - Low)	-			
Motor Information	Nominal_Freq	read only	x	x	x	FLOAT32 (High - Low)	-			
Motor Information	Max_St_Per_Hour	read only	x	x	x	FLOAT32 (High - Low)	-			
Motor Information	Max_Freq	read only	x	x	x	FLOAT32 (High - Low)	-			
Motor Information	Min_Freq	read only	x	x	x	FLOAT32 (High - Low)	-			
Sensor Locations/Types	TempIn1Location	read only	x	x	x	UINT8	ENUM			0=unused / 1=winding_top / 2=winding_bottom / 3=bearing_top / 4=bearing_bottom / 5=cooling_liquid / 6=motor_laminations
Sensor Locations/Types	TempIn2Location	read only	x	x	x	UINT8	ENUM			0=unused / 1=winding_top / 2=winding_bottom / 3=bearing_top / 4=bearing_bottom / 5=cooling_liquid / 6=motor_laminations
Sensor Locations/Types	TempIn3Location	read only	x	x	x	UINT8	ENUM			0=unused / 1=winding_top / 2=winding_bottom / 3=bearing_top / 4=bearing_bottom / 5=cooling_liquid / 6=motor_laminations
Sensor Locations/Types	TempIn4Location	read only	x	x	x	UINT8	ENUM			0=unused / 1=winding_top / 2=winding_bottom / 3=bearing_top / 4=bearing_bottom / 5=cooling_liquid / 6=motor_laminations
Sensor Locations/Types	TempIn5Location	read only	x	x	x	UINT8	ENUM			0=unused / 1=winding_top / 2=winding_bottom / 3=bearing_top / 4=bearing_bottom / 5=cooling_liquid / 6=motor_laminations
Sensor Locations/Types	VibrationExtern1Location	read only	x	x	x	UINT8	ENUM			0=unused / 1=motor_hut_x / 2=motor_hut_y / 3=bearing_top_x / 4=bearing_ top_y / 5=bearing_bottom_x / 6=bearing_bottom_y
Sensor Locations/Types	VibrationExtern2Location	read only	x	x	x	UINT8	ENUM			0=unused / 1=motor_hut_x / 2=motor_hut_y / 3=bearing_top_x / 4=bearing_ top_y / 5=bearing_bottom_x / 6=bearing_bottom_y
Sensor Locations/Types	CurrentIn1Type	read only	x	x	x	UINT8	ENUM			0=unused / 1=current_signal_only / 2=leackage_ switch / 3=sealing_CLP_V01 / 4=leackage_CLP_V02
Sensor Locations/Types	CurrentIn2Type	read only	x	x	x	UINT8	ENUM			0=unused / 1=current_signal_only / 2=leackage_ switch / 3=sealing_CLP_V01 / 4=leackage_CLP_V03
Data Readouts	Temperature0	read only	x	x	x	FLOAT32 (High - Low)	-			
Data Readouts	Temperature1	read only	x	x	x	FLOAT32 (High - Low)	-			
Data Readouts	Tempreature2	read only	x	x	x	FLOAT32 (High - Low)	-			
Data Readouts	Temperature3	read only	x	x	x	FLOAT32 (High - Low)	-			
Data Readouts	Temperature4	read only	x	x	x	FLOAT32 (High - Low)	-			
Data Readouts	Temperature5	read only	x	x	x	FLOAT32 (High - Low)	-			
Data Readouts	Current0	read only	x	x	x	FLOAT32 (High - Low)	-			
Data Readouts	Current1	read only	x	x	x	FLOAT32 (High - Low)	-			
Data Readouts	Vibration0	read only	x	x	x	FLOAT32 (High - Low)	-			
Data Readouts	Vibration1	read only	x	x	x	FLOAT32 (High - Low)	-			
Data Readouts	Vibration2	read only	x	x	x	FLOAT32 (High - Low)	-			
Data Readouts	Vibration3	read only	x	x	x	FLOAT32 (High - Low)	-			
Data Readouts	Vibration4	read only	x	x	x	FLOAT32 (High - Low)	-			
Data Readouts	FC_power	read only	-	x	x	FLOAT32 (High - Low)	-			
Data Readouts	FC_Voltage	read only	-	x	x	FLOAT32 (High - Low)	-			
Data Readouts	FC_Current	read only	-	x	x	FLOAT32 (High - Low)	-			
Data Readouts	FC_Frequency	read only	-	x	x	FLOAT32 (High - Low)	-			
Data Readouts	Level	read only	x	x	x	FLOAT32 (High - Low)	-			
Data Readouts	Pressure	read only	x	x	x	FLOAT32 (High - Low)	-			
Data Readouts	Flow	read only	x	x	x	FLOAT32 (High - Low)	-			
Data Readouts	Running_Hours	read only	x	x	x	UINT64	1			

Group	Symbol	MODE	DDI	LPI	LSI	TYPE	Scaling	Bit	Bit-Function	Description
Data Readouts	Pump_Cycles	read only	x	x	x	UINT64	1			
Data Readouts	Cleaning_Cycles	read only	x	x	x	UINT64	1			
Data Readouts	Energy_Consumption	read only	-	x	x	UINT64	1			
Time	System_Current_Year	read only	x	x	x	UINT8	1			
Time	System_Current_Month	read only	x	x	x	UINT8	1			
Time	System_Current_Day	read only	x	x	x	UINT8	1			
Time	System_Current_Hour	read only	x	x	x	UINT8	1			
Time	System_Current_Minute	read only	x	x	x	UINT8	1			
Time	System_Current_Second	read only	x	x	x	UINT8	1			
Time	System_Uptime	read only	x	x	x	UINT32	1			
Time	System_Current_Ms	read only	x	x	x	UINT32	1			
Control Word	Control Word	read/write	x	x	x	UINT16	Bitfield	0	Reset	
								1	Start	Applies only for LPI
								2		
								3		
								4		
								5		
								6		
								7		
								8		
								9		
								10		
								11		
								12		
								13		
								14		
								15	Save_Config	Rising edge of this Bit is needed after changing a parameter of the group *Control Word* . This is not applicable for *Reset, Start and MB_Bus_Control_Value*
Control Word	Bus_Control_Value	read/write	-	x	x	UINT16	100			
Control Word	Operation_Mode	read/write	-	x	x	UINT8	ENUM			0=manual / 1=auto / 2=off
Control Word	Manual_Frequency	read/write	-	x	x	UINT16	100			
Control Word	FC_Ramp_Up_Time	read/write	-	x	x	UINT17	100			
Control Word	FC_Ramp_Down_Time	read/write	-	x	x	UINT18	100			
Control Word	Enable_Thermostat_Mode	read/write	-	x	x	UINT19	ENUM			0=off / 1=on
Control Word	Enable_Pump_Kick	read/write	-	x	x	UINT20	ENUM			0=off / 1=on
Control Word	Allow_Anticlog	read/write	-	x	x	UINT21	ENUM			0=off / 1=on
Sensor Trip/Warning	Temp_Sensors0_Warning	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Temp_Sensors0_Trip	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Temp_Sensors1_Warning	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Temp_Sensors1_Trip	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Temp_Sensors2_Warning	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Temp_Sensors2_Trip	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Temp_Sensors3_Warning	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Temp_Sensors3_Trip	read/write	x	x	x	UINT16	10			

Group	Symbol	MODE	DDI	LPI	LSI	TYPE	Scaling	Bit	Bit-Function	Description
Sensor Trip/Warning	Temp_Sensors4_Warning	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Temp_Sensors4_Trip	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Vib_Sensors0_Warning	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Vib_Sensors0_Trip	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Vib_Sensors1_Warning	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Vib_Sensors1_Trip	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Vib_Sensors2_Warning	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Vib_Sensors2_Trip	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Vib_Sensors3_Warning	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Vib_Sensors3_Trip	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Vib_Sensors4_Warning	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Vib_Sensors4_Trip	read/write	x	x	x	UINT16	10			

9.1.3 ModBus TCP: LSI Master-Parameter

Group	Symbol	Register Type	Address in LSI	Size	Data Type	Scaling	Bit	Bit-Function	Description
System Variables	MB_Sys_Status_Word	Input Registers	10000	1	UINT	Bitfield	0	Run	
							1	Rising_Water_Level	
							2	Falling_Water_Level	
							3	External_Off	
							4		
							5	Anticlog_Running	
							6		
							7		
							8		
							9		
							10		
							11		
							12	Warning Type D is active	
							13	Warning Type C is active	
							14	Error Type B is active	
							15	Error Type A is active	
System Variables	MS_Sys_Warning_Word_MSB	Input Registers	10001	2	DWORD (High - Low)	Bitfield		no content	
System Variables	MS_Sys_Warning_Word_LSB	Input Registers	10003	2	DWORD (High - Low)	Bitfield	0	Warning_In_Pump_1	
							1	Warning_In_Pump_2	
							2	Warning_In_Pump_3	
							3	Warning_In_Pump_4	
							4	Pipe_Sedimentation_High	
							5	IO_Extension_Comm_Err	
							6		
							7		
							8		
							9		
							10		
							11		
							12		
							13		
							14		
							15		
							16		
							17		
							18		
							19		
							20		
							21		
							22		
							23		
							24		
							25		
							26		
							27		

Group	Symbol	Register Type	Address in LSI	Size	Data Type	Scaling	Bit	Bit-Function	Description
							28		
							29		
							30		
							31		
System Variables	MS_Sys_Alarm_Word_MSB	Input Registers	10005	2	DWORD (High - Low)	Bitfield		no content	
System Variables	MS_Sys_Alarm_Word_LSB	Input Registers	10007	2	DWORD (High - Low)	Bitfield	0	Pump_Unit_Offline_1	
							1	Pump_Unit_Offline_2	
							2	Pump_Unit_Offline_3	
							3	Pump_Unit_Offline_4	
							4	Master_Switched_1	
							5	Master_Switched_2	
							6	Master_Switched_3	
							7	Master_Switched_4	
							8	Alarm_In_Pump_1	
							9	Alarm_In_Pump_2	
							10	Alarm_In_Pump_3	
							11	Alarm_In_Pump_4	
							12	Dry_Run	
							13	High_Water	
							14	Sensor_Error	
							15		
							16		
							17		
							18		
							19		
							20		
							21		
							22		
							23		
							24		
							25		
							26		
							27		
							28		
							29		
							30		
							31		
Analog Variables	IO_Level.Value	Input Registers	10009	2	FLOAT32 (High - Low)	-			
Analog Variables	IO_Pressure.Value	Input Registers	10011	2	FLOAT32 (High - Low)	-			
Analog Variables	IO_Flow.Value	Input Registers	10013	2	FLOAT32 (High - Low)	-			
Analog Variables	IO_Frequency	Input Registers	10015	2	FLOAT32 (High - Low)	-			
Analog Variables	SYS_No_Of_Pumps	Input Registers	10017	1	UINT	-			
Data Time Variables	RI_System_Current_Year	Input Registers	10018	1	UINT	-			
Data Time Variables	RI_System_Current_Month	Input Registers	10019	1	UINT	-			
Data Time Variables	RI_System_Current_Day	Input Registers	10020	1	UINT	-			

Group	Symbol	Register Type	Address in LSI	Size	Data Type	Scaling	Bit	Bit-Function	Description
Data Time Variables	RI_System_Current_Hour	Input Registers	10021	1	UINT	-			
Data Time Variables	RI_System_Current_Minute	Input Registers	10022	1	UINT	-			
Data Time Variables	RI_System_Current_Second	Input Registers	10023	1	UINT	-			
Data Time Variables	RI_System_Uptime	Input Registers	10024	2	DWORD (High - Low)	-			
Data Time Variables	RI_System_Current_Ms	Input Registers	10026	2	DWORD (High - Low)	-			
Pump 1	MSC_Infos[0].Serial_Number	Input Registers	11000	8	String(16)	-			
Pump 1	MSC_Infos[0].Motor_Type	Input Registers	11008	16	String(32)	-			
Pump 1	MSC_Infos[0].Pump_Type	Input Registers	11024	16	String(32)	-			
Pump 1	MSC_Infos[0].Status	Input Registers	11040	1	UINT	-			
Pump 1	MSC_Infos[0].Warning_MSB	Input Registers	11041	2	DWORD (High - Low)	-			
Pump 1	MSC_Infos[0].Warning_LSB	Input Registers	11043	2	DWORD (High - Low)	-			
Pump 1	MSC_Infos[0].Alarm_MSB	Input Registers	11045	2	DWORD (High - Low)	-			
Pump 1	MSC_Infos[0].Alarm_LSB	Input Registers	11047	2	DWORD (High - Low)	-			
Pump 1	MSC_Infos[0].FC_Power	Input Registers	11049	2	FLOAT32 (High - Low)	-			
Pump 1	MSC_Infos[0].Operation_Hours	Input Registers	11051	2	DWORD (High - Low)	-			
Pump 1	MSC_Infos[0].Number_Of_Start	Input Registers	11053	2	DWORD (High - Low)	-			
Pump 1	MSC_Infos[0].Number_Of_Cleaning	Input Registers	11055	2	DWORD (High - Low)	-			
Pump 1	MSC_Infos[0].Energy_Consumption	Input Registers	11057	2	FLOAT32 (High - Low)	-			
Pump 2	MSC_Infos[1].Serial_Number	Input Registers	12000	8	String(16)	-			
Pump 2	MSC_Infos[1].Motor_Type	Input Registers	12008	16	String(32)	-			
Pump 2	MSC_Infos[1].Pump_Type	Input Registers	12024	16	String(32)	-			
Pump 2	MSC_Infos[1].Status	Input Registers	12040	1	UINT	-			
Pump 2	MSC_Infos[1].Warning_MSB	Input Registers	12041	2	DWORD (High - Low)	-			
Pump 2	MSC_Infos[1].Warning_LSB	Input Registers	12043	2	DWORD (High - Low)	-			
Pump 2	MSC_Infos[1].Alarm_MSB	Input Registers	12045	2	DWORD (High - Low)	-			
Pump 2	MSC_Infos[1].Alarm_LSB	Input Registers	12047	2	DWORD (High - Low)	-			
Pump 2	MSC_Infos[1].FC_Power	Input Registers	12049	2	FLOAT32 (High - Low)	-			
Pump 2	MSC_Infos[1].Operation_Hours	Input Registers	12051	2	DWORD (High - Low)	-			
Pump 2	MSC_Infos[1].Number_Of_Start	Input Registers	12053	2	DWORD (High - Low)	-			
Pump 2	MSC_Infos[1].Number_Of_Cleaning	Input Registers	12055	2	DWORD (High - Low)	-			
Pump 2	MSC_Infos[1].Energy_Consumption	Input Registers	12057	2	FLOAT32 (High - Low)	-			
Pump 3	MSC_Infos[2].Serial_Number	Input Registers	13000	8	String(16)	-			
Pump 3	MSC_Infos[2].Motor_Type	Input Registers	13008	16	String(32)	-			
Pump 3	MSC_Infos[2].Pump_Type	Input Registers	13024	16	String(32)	-			
Pump 3	MSC_Infos[2].Status	Input Registers	13040	1	UINT	-			
Pump 3	MSC_Infos[2].Warning_MSB	Input Registers	13041	2	DWORD (High - Low)	-			
Pump 3	MSC_Infos[2].Warning_LSB	Input Registers	13043	2	DWORD (High - Low)	-			
Pump 3	MSC_Infos[2].Alarm_MSB	Input Registers	13045	2	DWORD (High - Low)	-			
Pump 3	MSC_Infos[2].Alarm_LSB	Input Registers	13047	2	DWORD (High - Low)	-			
Pump 3	MSC_Infos[2].FC_Power	Input Registers	13049	2	FLOAT32 (High - Low)	-			
Pump 3	MSC_Infos[2].Operation_Hours	Input Registers	13051	2	DWORD (High - Low)	-			
Pump 3	MSC_Infos[2].Number_Of_Start	Input Registers	13053	2	DWORD (High - Low)	-			
Pump 3	MSC_Infos[2].Number_Of_Cleaning	Input Registers	13055	2	DWORD (High - Low)	-			
Pump 3	MSC_Infos[2].Energy_Consumption	Input Registers	13057	2	FLOAT32 (High - Low)	-			
Pump 4	MSC_Infos[3].Serial_Number	Input Registers	14100	8	String(16)	-			

Group	Symbol	Register Type	Address in LSI	Size	Data Type	Scaling	Bit	Bit-Function	Description
Pump 4	MSC_Infos[3].Motor_Type	Input Registers	14108	16	String(32)	-			
Pump 4	MSC_Infos[3].Pump_Type	Input Registers	14124	16	String(32)	-			
Pump 4	MSC_Infos[3].Status	Input Registers	14140	1	UINT	-			
Pump 4	MSC_Infos[3].Warning_MSB	Input Registers	14141	2	DWORD (High - Low)	-			
Pump 4	MSC_Infos[3].Warning_LSB	Input Registers	14143	2	DWORD (High - Low)	-			
Pump 4	MSC_Infos[3].Alarm_MSB	Input Registers	14145	2	DWORD (High - Low)	-			
Pump 4	MSC_Infos[3].Alarm_LSB	Input Registers	14147	2	DWORD (High - Low)	-			
Pump 4	MSC_Infos[3].FC_Power	Input Registers	14149	2	FLOAT32 (High - Low)	-			
Pump 4	MSC_Infos[3].Operation_Hours	Input Registers	14151	2	DWORD (High - Low)	-			
Pump 4	MSC_Infos[3].Number_Of_Start	Input Registers	14153	2	DWORD (High - Low)	-			
Pump 4	MSC_Infos[3].Number_Of_Cleaning	Input Registers	14155	2	DWORD (High - Low)	-			
Pump 4	MSC_Infos[3].Energy_Consumption	Input Registers	14157	2	FLOAT32 (High - Low)	-			
Control Word	MB_Sys_Control_Word	Holding Registers	10000	1	UINT	Bitfield	0	Reset	Reset errors on a rising edge of this bit
							1	PID_Controller_Bus_Enable	Activation of PID controller
							2	Trigger_Start_Level	Start emptying the pump sump
							3	Alternative_Start_Level	Activates the alternative start level configured via web interface
							4		
							5		
							6		
							7		
							8		
							9		
							10		
							11		
							12		
							13		
							14		
							15	Save_Config	Rising edge of this Bit is needed after changing a parameter of the group *Control Word* or group *Modes* . This is not applicable for *Reset* .
Modes	MB_Sys_Operating_Mode	Holding Registers	10001	1	UINT	ENUM			0=off /1=on
Modes	MB_Sys_Auto_Mode_Selection	Holding Registers	10002	1	UINT	ENUM			0=Level Control / 1=PID Controller / 2=High Efficiency Controller
PID Setpoint	MB_Sys_PID_Setpoint	Holding Registers	10200	1	UINT	100			Setpoint in % of scale multiplied by 100 (0 = 0%, 10000 = 100%)

9.1.4 OPC-UA: LSI Master-Parameter

Group	Symbol	MODE	TYPE	Scaling	Bit	Bit-Function	Description
System Variables	Sys_Status_Word	read only	UINT16	Bitfield	0	Run	
					1	Rising_Water_Level	
					2	Falling_Water_Level	
					3	External_Off	
					4		
					5	Anticlog_Running	
					6		
					7		
					8		
					9		
					10		
					11		
					12	Warning Type D is active	
					13	Warning Type C is active	
					14	Error Type B is active	
					15	Error Type A is active	
System Variables	Sys_Warning_Word_MSB	read only	UINT32	Bitfield		no content	
System Variables	Sys_Warning_Word_LSB	read only	UINT32	Bitfield	0	Warning_In_Pump_1	
					1	Warning_In_Pump_2	
					2	Warning_In_Pump_3	
					3	Warning_In_Pump_4	
					4	Pipe_Sedimentation_High	
					5	IO_Extension_Comm_Err	
					6		
					7		
					8		
					9		
					10		
					11		
					12		
					13		
					14		
					15		
					16		
					17		
					18		

Group	Symbol	MODE	TYPE	Scaling	Bit	Bit-Function	Description
					19		
					20		
					21		
					22		
					23		
					24		
					25		
					26		
					27		
					28		
					29		
					30		
					31		
System Variables	Sys_Alarm_Word_MSB	read only	UINT32	Bitfield		no content	
System Variables	Sys_Alarm_Word_LSB	read only	UINT32	Bitfield	0	Pump_Unit_Offline_1	
					1	Pump_Unit_Offline_2	
					2	Pump_Unit_Offline_3	
					3	Pump_Unit_Offline_4	
					4	Master_Switched_1	
					5	Master_Switched_2	
					6	Master_Switched_3	
					7	Master_Switched_4	
					8	Alarm_In_Pump_1	
					9	Alarm_In_Pump_2	
					10	Alarm_In_Pump_3	
					11	Alarm_In_Pump_4	
					12	Dry_Run	
					13	High_Water	
					14	Sensor_Error	
					15		
					16		
					17		
					18		
					19		
					20		
					21		

Group	Symbol	MODE	TYPE	Scaling	Bit	Bit-Function	Description
					22		
					23		
					24		
					25		
					26		
					27		
					28		
					29		
					30		
					31		
Analog Variables	Level.Value	read only	FLOAT32 (High - Low)	-			
Analog Variables	Pressure.Value	read only	FLOAT32 (High - Low)	-			
Analog Variables	Flow.Value	read only	FLOAT32 (High - Low)	-			
Analog Variables	Frequency.Value	read only	FLOAT32 (High - Low)	-			
Analog Variables	No_Of_Pumps	read only	UINT8	-			
Data Time Variables	System_Current_Year	read only	UINT8	-			
Data Time Variables	System_Current_Month	read only	UINT8	-			
Data Time Variables	System_Current_Day	read only	UINT8	-			
Data Time Variables	System_Current_Hour	read only	UINT8	-			
Data Time Variables	System_Current_Minute	read only	UINT8	-			
Data Time Variables	System_Current_Second	read only	UINT8	-			
Data Time Variables	System_Uptime	read only	UINT32	-			
Data Time Variables	System_Current_Ms	read only	UINT32	-			
Pump1	Master0_Serial_Number	read only	STRING256	-			
Pump1	Master0_Motor_Type	read only	STRING256	-			
Pump1	Master0_Pump_Type	read only	STRING256	-			
Pump1	Master0_Status	read only	UINT16	-			
Pump1	Master0_Warning_MSB	read only	UINT32	-			
Pump1	Master0_Warning_LSB	read only	UINT32	-			
Pump1	Master0_Alarm_MSB	read only	UINT32	-			
Pump1	Master0_Alarm_LSB	read only	UINT32	-			
Pump1	Master0_FC_Power	read only	FLOAT32 (High - Low)	-			
Pump1	Master0_Operating_Hours	read only	UINT32	-			
Pump1	Master0_Number_Of_Start	read only	UINT32	-			
Pump1	Master0_Number_Of_Cleaning	read only	UINT32	-			
Pump1	Master0_Energy_Consumption	read only	FLOAT32 (High - Low)	-			

Group	Symbol	MODE	TYPE	Scaling	Bit	Bit-Function	Description
Pump2	Master1_Serial_Number	read only	STRING256	-			
Pump2	Master1_Motor_Type	read only	STRING256	-			
Pump2	Master1_Pump_Type	read only	STRING256	-			
Pump2	Master1_Status	read only	UINT16	-			
Pump2	Master1_Warning_MSB	read only	UINT32	-			
Pump2	Master1_Warning_LSB	read only	UINT32	-			
Pump2	Master1_Alarm_MSB	read only	UINT32	-			
Pump2	Master1_Alarm_LSB	read only	UINT32	-			
Pump2	Master1_FC_Power	read only	FLOAT32 (High - Low)	-			
Pump2	Master1_Operating_Hours	read only	UINT32	-			
Pump2	Master1_Number_Of_Start	read only	UINT32	-			
Pump2	Master1_Number_Of_Cleaning	read only	UINT32	-			
Pump2	Master1_Energy_Consumption	read only	FLOAT32 (High - Low)	-			
Pump3	Master2_Serial_Number	read only	STRING256	-			
Pump3	Master2_Motor_Type	read only	STRING256	-			
Pump3	Master2_Pump_Type	read only	STRING256	-			
Pump3	Master2_Status	read only	UINT16	-			
Pump3	Master2_Warning_MSB	read only	UINT32	-			
Pump3	Master2_Warning_LSB	read only	UINT32	-			
Pump3	Master2_Alarm_MSB	read only	UINT32	-			
Pump3	Master2_Alarm_LSB	read only	UINT32	-			
Pump3	Master2_FC_Power	read only	FLOAT32 (High - Low)	-			
Pump3	Master2_Operating_Hours	read only	UINT32	-			
Pump3	Master2_Number_Of_Start	read only	UINT32	-			
Pump3	Master2_Number_Of_Cleaning	read only	UINT32	-			
Pump3	Master2_Energy_Consumption	read only	FLOAT32 (High - Low)	-			
Pump4	Master3_Serial_Number	read only	STRING256	-			
Pump4	Master3_Motor_Type	read only	STRING256	-			
Pump4	Master3_Pump_Type	read only	STRING256	-			
Pump4	Master3_Status	read only	UINT16	-			
Pump4	Master3_Warning_MSB	read only	UINT32	-			
Pump4	Master3_Warning_LSB	read only	UINT32	-			
Pump4	Master3_Alarm_MSB	read only	UINT32	-			
Pump4	Master3_Alarm_LSB	read only	UINT32	-			
Pump4	Master3_FC_Power	read only	FLOAT32 (High - Low)	-			
Pump4	Master3_Operating_Hours	read only	UINT32	-			

Group	Symbol	MODE	TYPE	Scaling	Bit	Bit-Function	Description
Pump4	Master3_Number_Of_Start	read only	UINT32	-			
Pump4	Master3_Number_Of_Cleaning	read only	UINT32	-			
Pump4	Master3_Energy_Consumption	read only	FLOAT32 (High - Low)	-			
Control Word	Sys_Control_Word	read/write	UINT16	Bitfield	0	Reset	Reset errors on a rising edge of this bit
					1	PID_Controller_Bus_Enable	Activation of PID controller
					2	Trigger_Start_Level	Start emptying the pump sump
					3	Alternative_Start_Level	Activates the alternative start level configured via web interface
					4		
					5		
					6		
					7		
					8		
					9		
					10		
					11		
					12		
					13		
					14		
					15	Save_Config	Save configuration
Modes	Sys_Operating_Mode	read/write	UINT8	ENUM			0=off /1=on
Modes	Sys_Auto_Mode_Selection	read/write	UINT8	ENUM			0=Level Control / 1=PID Controller / 2=High Efficiency Controller
PID Setpoint	Sys_PID_Setpoint.Variable	read/write	UINT16	100			Setpoint in % of scale multiplied by 100 (0 = 0%, 10000 = 100%)

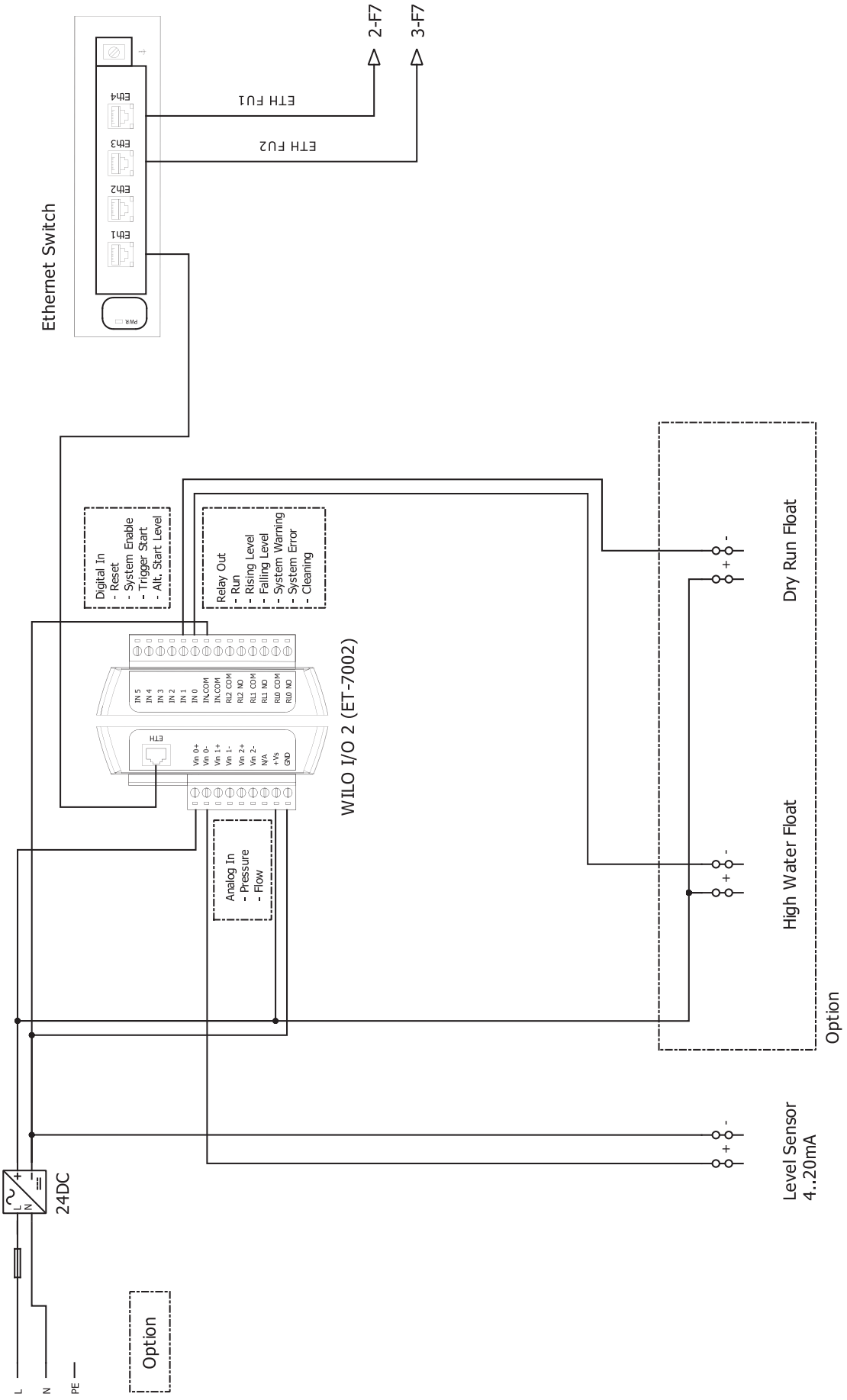
9.2 LSI 系统模式的示例电路图

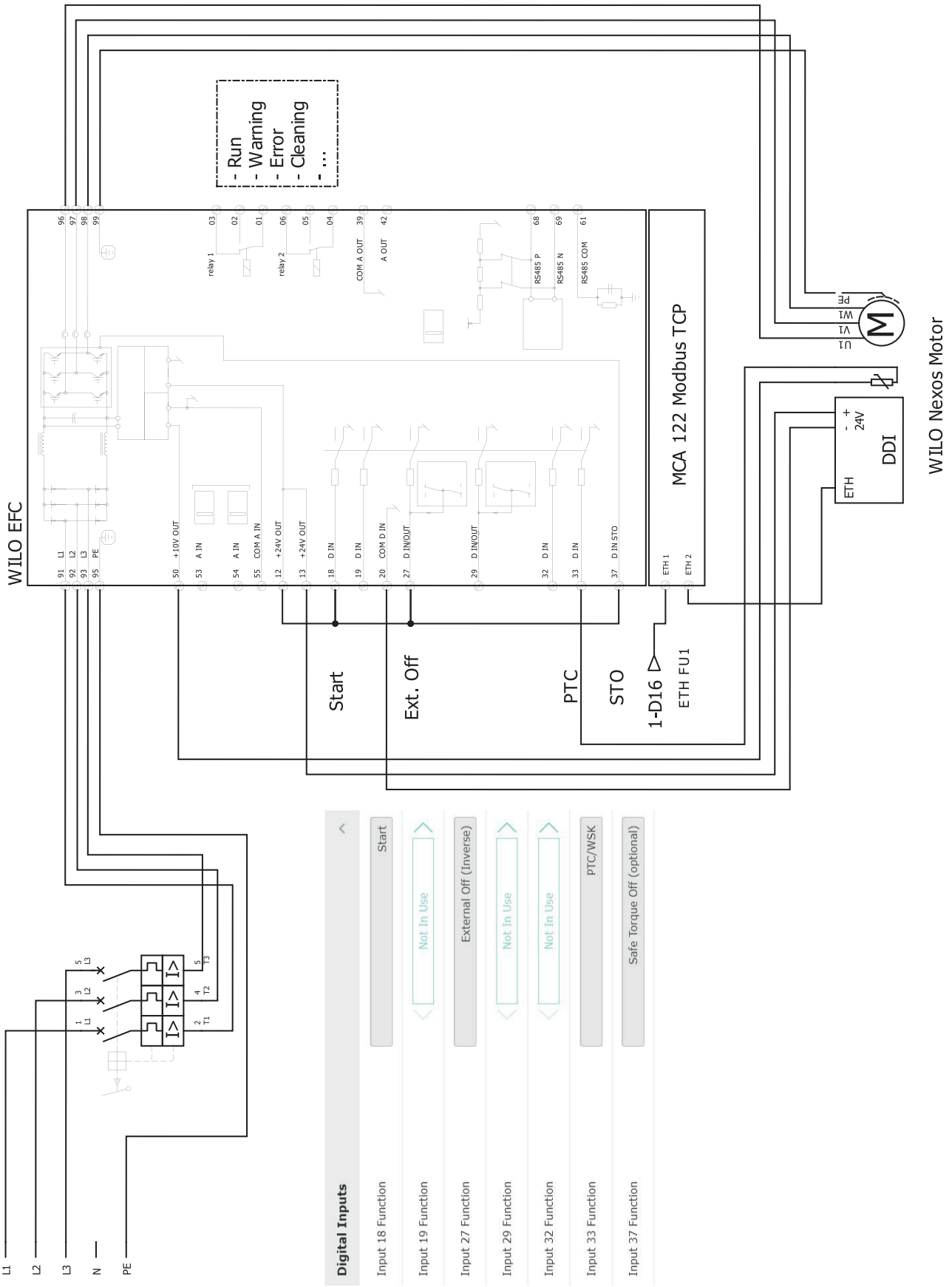
注意！ 以下为带有两个水泵的泵站的电路图。变频器和水泵的接线电路图也适用于泵站的水泵 **3** 和 **4**。

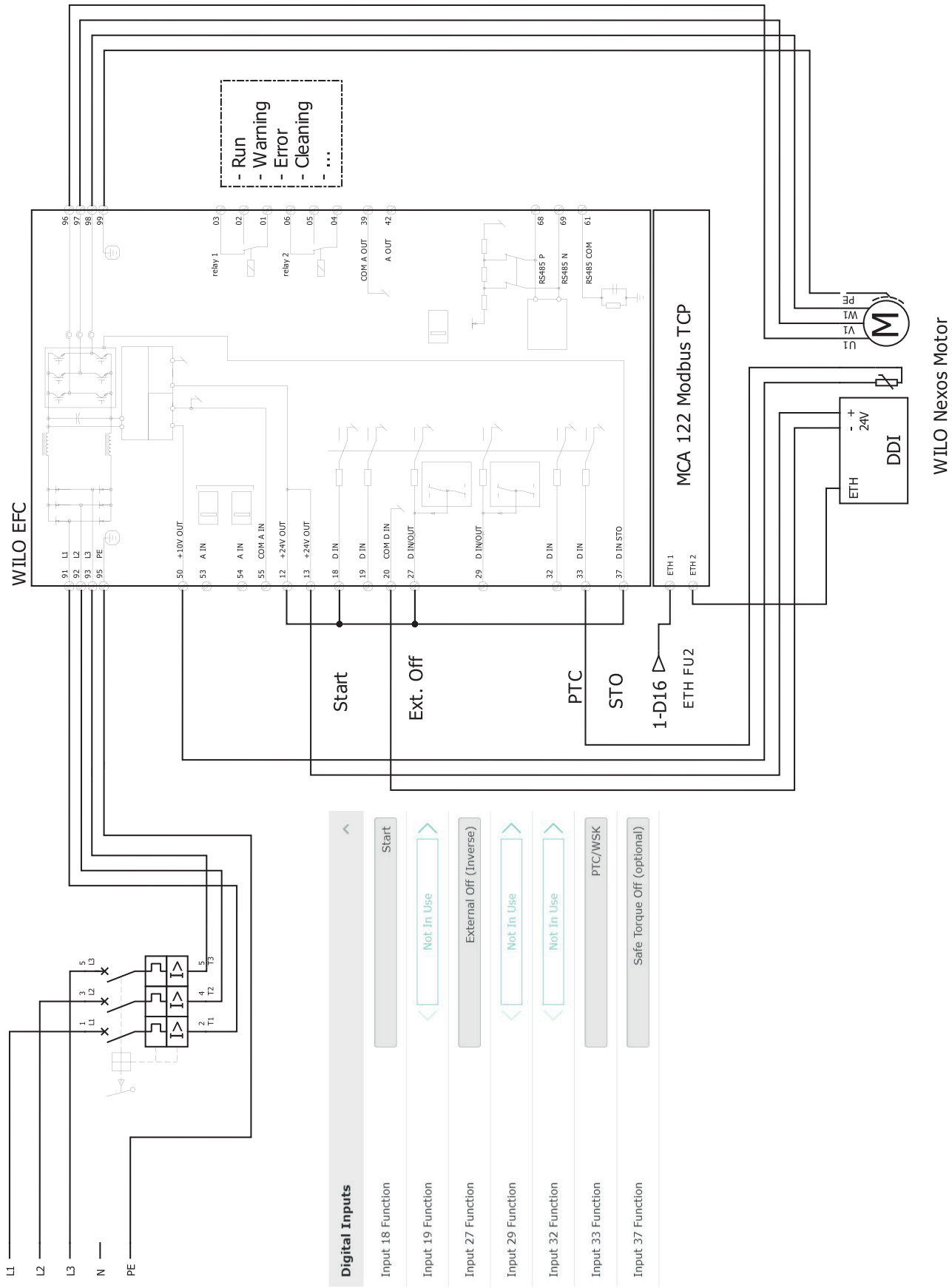
另请参见

- LSI系统模式：不带Ex的连接示例 [▶ 90]
- LSI系统模式：Ex的连接示例 [▶ 93]

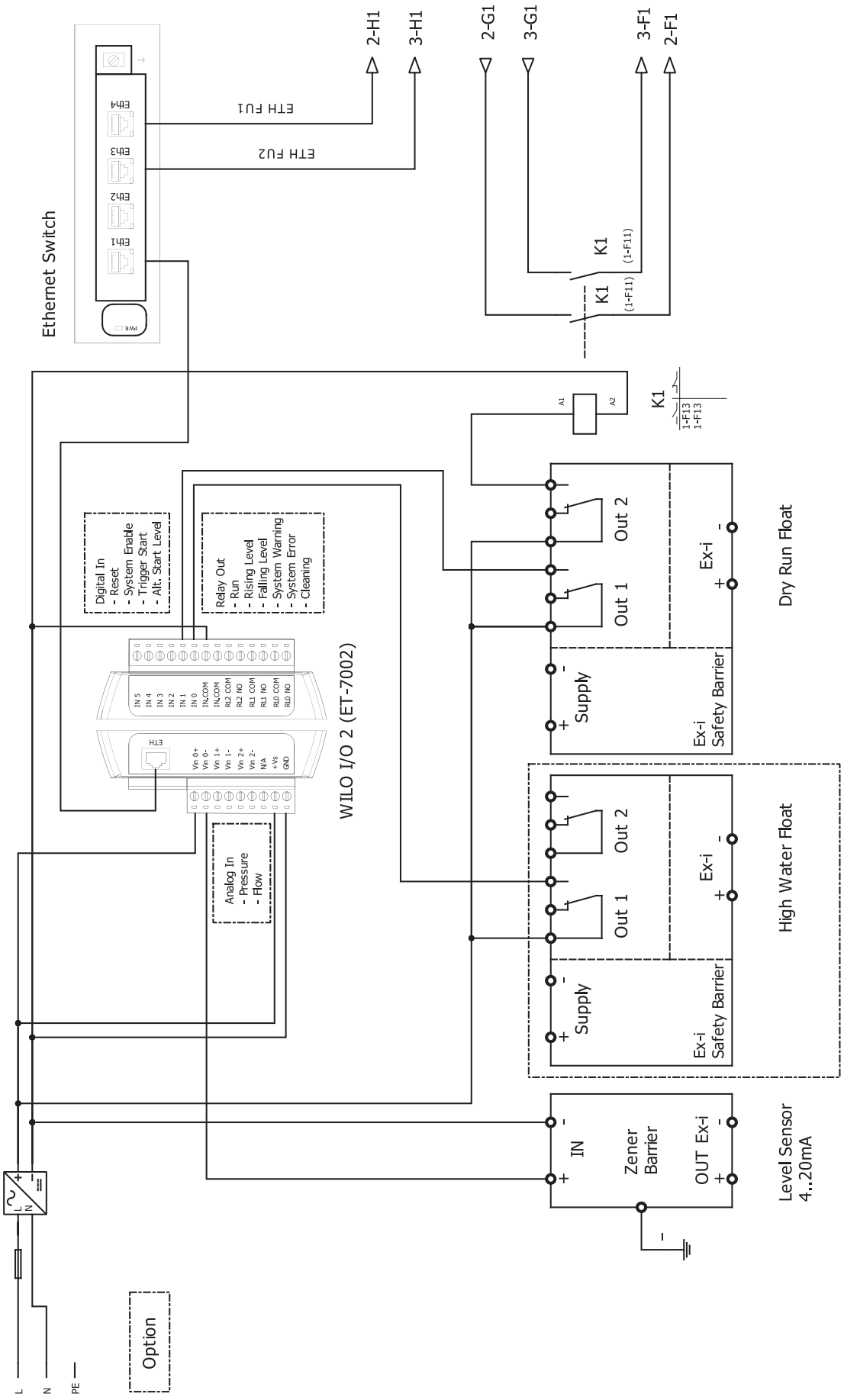
9.2.1 LSI系统模式：不带Ex的连接示例

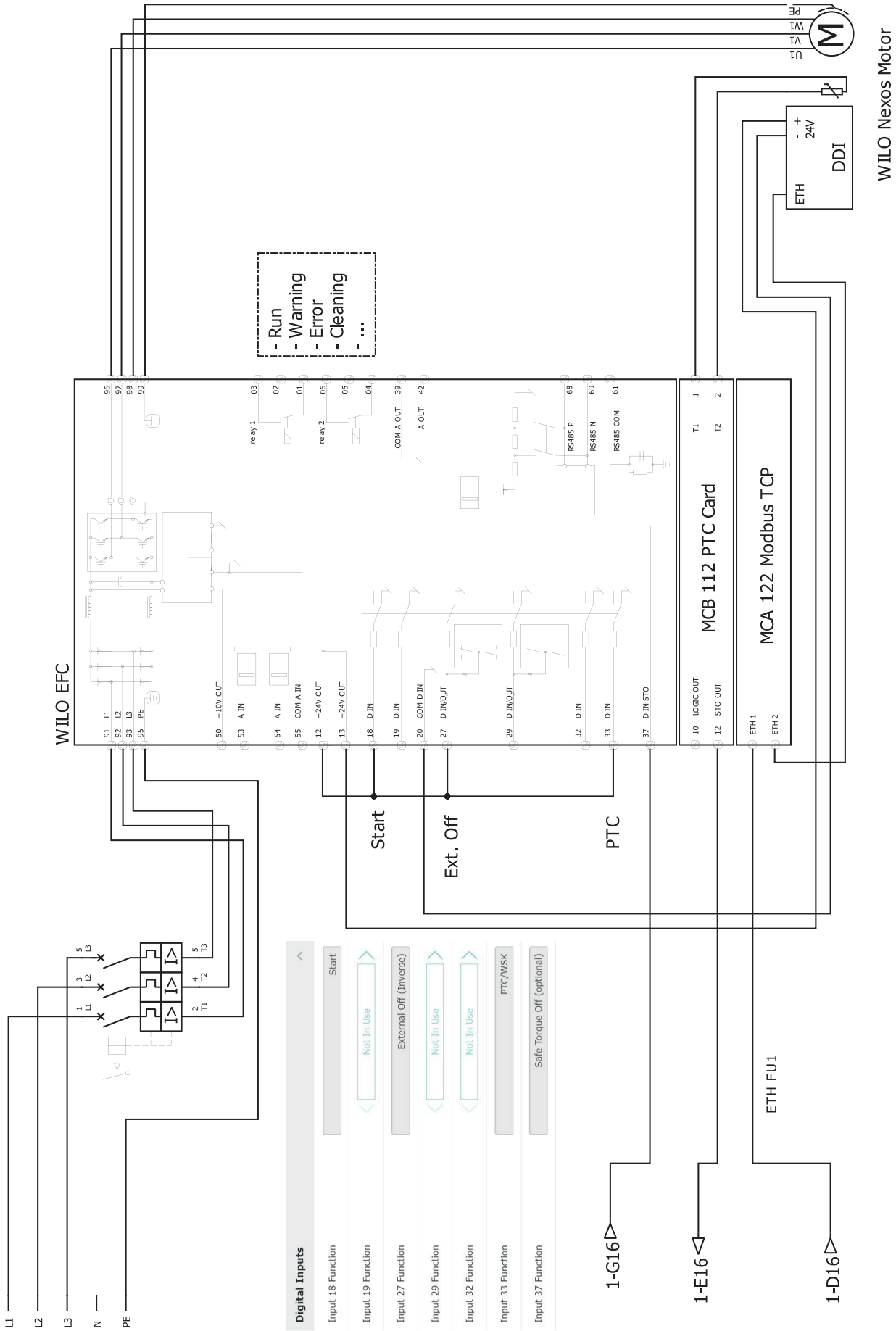



WILO EFC
MCA 122 Modbus TCP
WILO Nexos Motor
DDI
- Run
- Warning
- Error
- Cleaning
- ...
Start
Ext. Off
PTC
STO
1-D16
ETH FU1
L1
L2
L3
N
PE
Digital Inputs
Input 18 Function
Input 19 Function
Input 27 Function
Input 29 Function
Input 32 Function
Input 33 Function
Input 37 Function
Start
Not In Use
External Off (Inverse)
Not In Use
Not In Use
PTC/WSK
Safe Torque Off (optional)


- Run
- Warning
- Error
- Cleaning
- ...
WILO EFC
MCA 122 Modbus TCP
WILO Nexos Motor
DDI
ETH
24V
Start
Ext. Off
PTC
STO
1-D16
ETH FU2
L1
L2
L3
N
PE
Digital Inputs
Input 18 Function
Input 19 Function
Input 27 Function
Input 29 Function
Input 32 Function
Input 33 Function
Input 37 Function
Start
Not In Use
External Off (Inverse)
Not In Use
Not In Use
PTC/WSK
Safe Torque Off (optional)

9.2.2 LSI系统模式：Ex的连接示例




WILO Nexos Motor
U1
V1
W1
PE
DDI
ETH
24V
- Run
- Warning
- Error
- Cleaning
- ...
WILO EFC
MCB 112 PTC Card
MCA 122 Modbus TCP
Start
Ext. Off
PTC
ETH FU1
1-G16
1-E16
1-D16
L1
L2
L3
N
PE
Digital Inputs
Input 18 Function
Input 19 Function
Input 27 Function
Input 29 Function
Input 32 Function
Input 33 Function
Input 37 Function
Start
Not In Use
External Off (Inverse)
Not In Use
Not In Use
PTC/WSK
Safe Torque Off (optional)

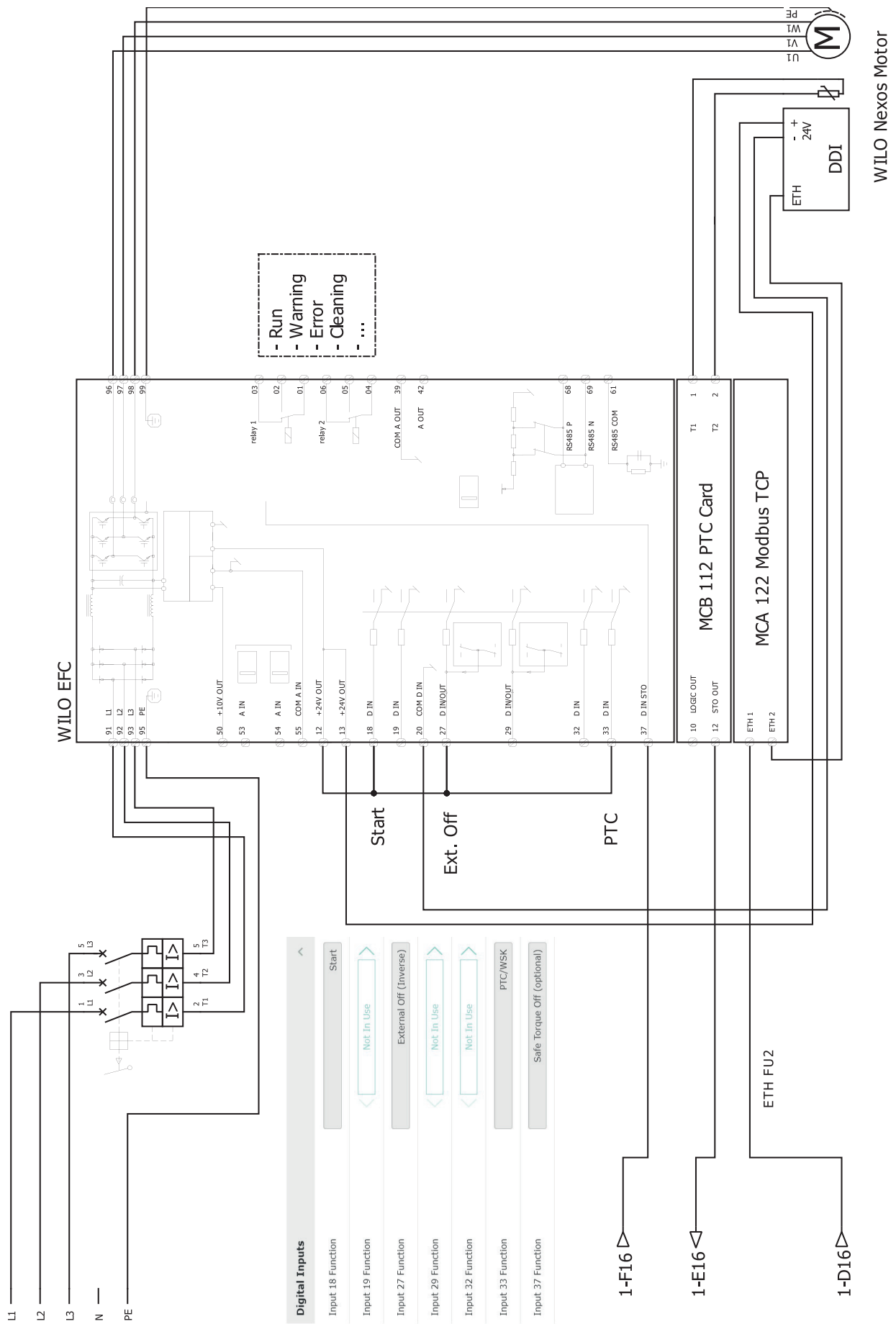

WILO Nexos Motor
U1
V1
W1
PE
DDI
ETH
24V
- Run
- Warning
- Error
- Cleaning
- ...
WILO EFC
MCB 112 PTC Card
MCA 122 Modbus TCP
Start
Ext. Off
PTC
ETH FU2
1-F16
1-E16
1-D16
L1
L2
L3
N
PE
Digital Inputs
Input 18 Function
Input 19 Function
Input 27 Function
Input 29 Function
Input 32 Function
Input 33 Function
Input 37 Function
Start
Not In Use
External Off (Inverse)
Not In Use
Not In Use
PTC/WSK
Safe Torque Off (optional)

Table of contents

1 General information

1.1 About these instructions

These instructions form part of the product. Adherence to these instructions is a requirement for the intended use and correct operation of the product:
→ Carefully read the instructions prior to any activities on and with the product.
→ Keep the instructions in an accessible place at all times.
→ Observe all product specifications and labels on the device.

The language of the original operating instructions is German. Versions of these instructions in any other language are translations of the original operating instructions.

1.2 Copyright

Wilo shall reserve the right to change the listed data without notice and shall not be liable for technical inaccuracies and/or omissions.

1.3 Network connection (LAN)

Integrate the product into a local Ethernet network (LAN) to enable correct functionality (configuration and operation). There is a risk of unauthorised network access to Ethernet networks. This may enable product manipulations. For this reason, the statutory stipulations or other internal regulations as well as the following specifications must be adhered to:
→ Deactivate unused communication channels.
→ Assign secure access passwords.
→ Immediately change default passwords.
→ Install an additional security appliance upstream.
→ Adhere to protective measures specified in the current IT security requirements and applicable standards (e.g. setting up VPN for remote access).

Wilo shall not be liable for damage to the product or damage caused by the product provided this comes as a result of the network connection or access to said network.

1.4 Scope of software functions

These instructions describe the complete functional scope of the Digital Data Interface software. However, customers are exclusively entitled to the Digital Data Interface software scope specified in the order confirmation. Customers are welcome to retrospectively purchase any other available Digital Data Interface software functions.

1.5 Personal data

Personal data is not processed in connection with the use of the product. **NOTICE! Do not enter any personal data (e.g. e-mail address, phone number, etc.) in the fields for the installation and maintenance logbook to prevent conflicts with data protection specifications!**

1.6 Subject to change

Wilo shall reserve the rights to make technical changes to the product and individual components. The illustrations used may differ from the original and are intended as a sample representation of the device.

1.7 Exclusion from warranty and liability

Wilo shall specifically not assume any warranty or liability in the following cases:
→ Network on site not available or unstable
→ Damage (directly or indirectly) as a result of technical issues, e.g. server failure, transfer errors
→ Damage caused by third-party suppliers' external software
→ Damage caused by third parties, e.g. hacking, virus
→ Unauthorised modifications to the Digital Data Interface software
→ Non-compliance with these instructions
→ Improper use
→ Incorrect storage or transport
→ Incorrect installation or dismantling

2 Safety

2.1 Personnel qualifications

Electrical connection

Personnel must meet the following prerequisites:
- → Qualified electrician
- → Network skills to assemble network cables

Operation

Operating personnel must meet the following prerequisites to configure and operate pumps:
- → Safe handling of web-based, English user interfaces
- → Specialist language skills, particularly in English, for the following specialist areas
  - – Electrical engineering, specialising in frequency converters
  - – Pump technology, specialising in operating pump systems
  - – Network technology, configuring network components

Definition of "qualified electrician"

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

2.2 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.
- → Earth the product.
- → Observe technical information.
- → Replace a defective connection cable immediately.

2.3 Functional safety

Note the following if the pump is operated within explosive environments:
- → Install dry-running protection and connect using an Ex-i evaluation relay.
- → Connect level sensor via a Zener barrier.
- → Connect thermal motor monitoring using Ex-certified evaluation relay. It is possible to retrofit the "MCB 112" PTC thermistor card in the frequency converter for a connection to the Wilo-EFC!
- → In connection with a frequency converter, connect dry-running protection and thermal motor monitoring to the Safe Torque Off (STO).

SIL level

Provide safety equipment with SIL-Level 1 and hardware fault tolerance 0 (according to DIN EN 50495, category 2). Consider all components within the safety circuit for system assessment. Refer to the individual components' manufacturer's instructions for the required information.

The built-in capacitive sensor CLP01 is type-tested separately according to guideline 2014/34/EU. The label is: II 2G Ex db IIB Gb.

2.4 Data security

All network requirements, in particular network security requirements, must be complied with to integrate the product into the network. For this purpose, buyers or operators must comply with all valid, national and international directives (e.g. Kritis Directive) or statutory stipulations.

2.5 Emergency operation in applications critical to safety

The pump and frequency converter are controlled by the parameters input at the corresponding device. The pump also overwrites the frequency converter's parameter set 1 in LPI and LSI mode. We recommend creating a backup of corresponding configurations and saving them in a central location to guarantee fast troubleshooting.

NOTICE! It is possible to save a further configuration in the frequency converter in applications critical to safety. In the event of a fault, the frequency converter can be operated in emergency operation using this configuration.

3 Product description

3.1 Structure

The Digital Data Interface is a communication module with integrated web server that has been integrated in the motor. It is accessed and controlled in an Internet browser using a graphical user interface. The user interface enables easy pump configuration, control and monitoring. Different sensors may have been installed in the pump for this purpose. External signal transmitters may also input additional system parameters in the control. The Digital Data Interface is capable of the following, depending on the system mode:

- → Pump monitoring.
- → Controlling the pump with a frequency converter.
- → Controlling the complete system with up to four pumps.

3.2 System modes

The Digital Data Interface can be licensed for three different system modes:

- → DDI system mode
  System mode with no control function. Only temperature and vibration sensor values are recorded, evaluated and saved. The pump and the frequency converter (if present) are controlled via the operator's primary control.
- → LPI system mode
  System mode with control function for frequency converters and clogging detection. The pump/frequency converter pairing works as a unit: the frequency converter is controlled through the pump. This allows clogging detection to be carried out and, if necessary, a cleaning process to be started. Level-dependent control of the pump takes place via the operator's primary control.
- → LSI system mode
  System mode for complete control of the pumping station with up to four pumps. In this process, one pump operates as the master and all other pumps are slaves. The master pump controls all other pumps depending on the system-specific parameters.

Licence keys enable system mode. System modes with less comprehensive functional scopes are included.

3.3 Functional overview depending on the system mode

Function	System mode		
	DDI	LPI	LSI
User interface			
Web server	•	•	•
Language selection	•	•	•
User password	•	•	•
Uploading/downloading the configuration	•	•	•
Resetting to factory setting	•	•	•
Data display			
Rating plate data	•	•	•
Test protocol	o	o	o
Installation logbook	•	•	•
Maintenance logbook	•	•	•
Recording and saving data			
Internal sensors	•	•	•
Internal sensors via fieldbus	•	•	•
Frequency converter	–	•	•
Pumping station	–	–	•
Interfaces			
Support for external inputs/outputs	•	•	•
ModBus TCP	•	•	•
OPC UA	o	o	o
Controlling the frequency converter	–	•	•

Function	System mode		
	DDI	LPI	LSI
Control functions			
Non-immersed operation	–	•	•
Clogging detection/cleaning process	–	•	•
External control values (analogue/digital)	–	•	•
External off	–	•	•
Pump kick	–	•	•
Dry-running protection	–	•	•
Flood control	–	•	•
Pump cycling	–	–	•
Standby pump	–	–	•
Selecting the pump operation mode	–	–	•
Level control with level sensor and float switch	–	–	•
PID control	–	–	•
Redundant master pump	–	–	•
Alternative stop levels	–	–	•
High Efficiency (HE) controller	–	–	•

Key
– = Not available, o = Optional, • = Available

3.4 Inputs

The Digital Data Interface features two integrated sensors and nine connections for external sensors.

Internal sensors (onboard)
→ Temperature
Records the current temperature of the Digital Data Interface module.
→ Vibration
Records the current vibrations at the Digital Data Interface along three axes.

Internal sensors (in motor)
→ 5x Temperature (Pt100, Pt1000, PTC)
→ 2x Analogue inputs 4–20 mA
→ 2x Inputs for vibration sensors (at max. 2 channels)

3.5 I/O modules – additional inputs and outputs

A host of measuring data is required to control the pump/frequency converter combination (LPI system mode) or the complete system (LSI system mode). Usually the frequency converter provides a sufficient number of analogue and digital inputs and outputs. If required, inputs and outputs can be supplemented by two I/O modules:
→ Wilo IO 1 (ET-7060): 6x Digital inputs and outputs
→ Wilo IO 2 (ET-7002): 3x Analogue and 6x digital inputs, 3x digital outputs

NOTICE

Wilo IO 2 for LSI system mode is mandatory!
Include Wilo IO 2 (ET-7002) in system planning to record all required measured values! System control is not possible without Wilo IO 2.

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.

DANGER

Risk of explosion due to incorrect connection!

If the pump is used in an explosive atmosphere, there is a risk of explosion due to incorrect connection. Observe the following points:

- Install dry-running protection.
- Connect float switch via Ex-i evaluation relay.
- Connect level sensor via Zener barrier.
- Connect thermal motor monitoring and dry-running protection to "Safe Torque Off (STO)".
- Observe information in chapter "Electrical connection in potentially explosive atmospheres"!

4.1 Personnel qualifications

Personnel must meet the following prerequisites:
→ Qualified electrician
→ Network skills to assemble network cables

4.2 Prerequisites

Overview of required components depending on the applied system mode:

Prerequisite	System mode		
	DDI	LPI	LSI
Installation without Ex			
Pump with Digital Data Interface	•	•	•
24 VDC control voltage	•	•	•
Evaluation device for PTC sensor	•	•	•
Frequency converter Wilo-EFC with Ethernet module “MCA 122” (ModBus TCP module)	–	•	•
Primary control for setpoint or start/stop specification	–	•	o
Float switch for dry-running protection	–	o	o
Level sensor for specification of setpoint	–	–	•
Network switch (LAN switch)	•	•	•
Wilo IO 1 (ET-7060)	o	o	–
Wilo IO 2 (ET-7002)	o	o	•
Additional requirements for installations with Ex			
"MCB 112" Wilo-EFC PTC thermistor card enhancement or evaluation device with Ex rating for PTC sensor	•	•	•
Float switch for dry-running protection with Ex cut-off relay	•	•	•
Zener barrier for level sensor	–	–	•

Key
– = Not required, o = If required, • = Mandatory

4.3 Digital Data Interface connection cable

Description

A hybrid cable is used as the control cable. The hybrid cable merges two cables in one:
→ Signal cable for control voltage and winding monitor
→ Network cable

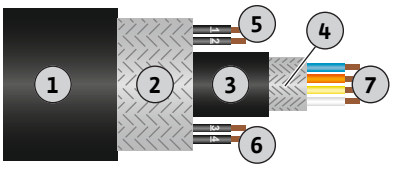


Fig. 1: Hybrid cable diagram

Pos.	Wire no/colour	Description
1		Outer cable sheath
2		Outer cable shielding
3		Inner cable sheath
4		Inner cable shielding
5	1 = +	Connection wires for Digital Data Interface power supply. Operating voltage: 24 VDC (12–30 V FELV, max. 4.5 W)
	2 = –	
6	3/4 = PTC	PTC sensor connection wires in the motor winding. Operating voltage: 2.5 to 7.5 VDC
7	White (wh) = RD+	Prepare the network cable and install the supplied RJ45 plug.
	Yellow (ye) = TD+	
	Orange (og) = TD–	
	Blue (bu) = RD–	

NOTICE! Widely position cable shielding!

Technical data

- Type: TECWATER HYBRID DATA
- Wires, outer cable bundle: 4x0.5 ST
- Wires, inner cable bundle: 2x 2x22AWG
- Material: Special elastomer, irradiated, resistant to water and oil, dual shielding
- Diameter: approx. 13.5 mm
- Bend radius: 81 mm
- Max. water temperature: 40 °C
- Ambient temperature: –25 °C to 40 °C

4.4 DDI system mode

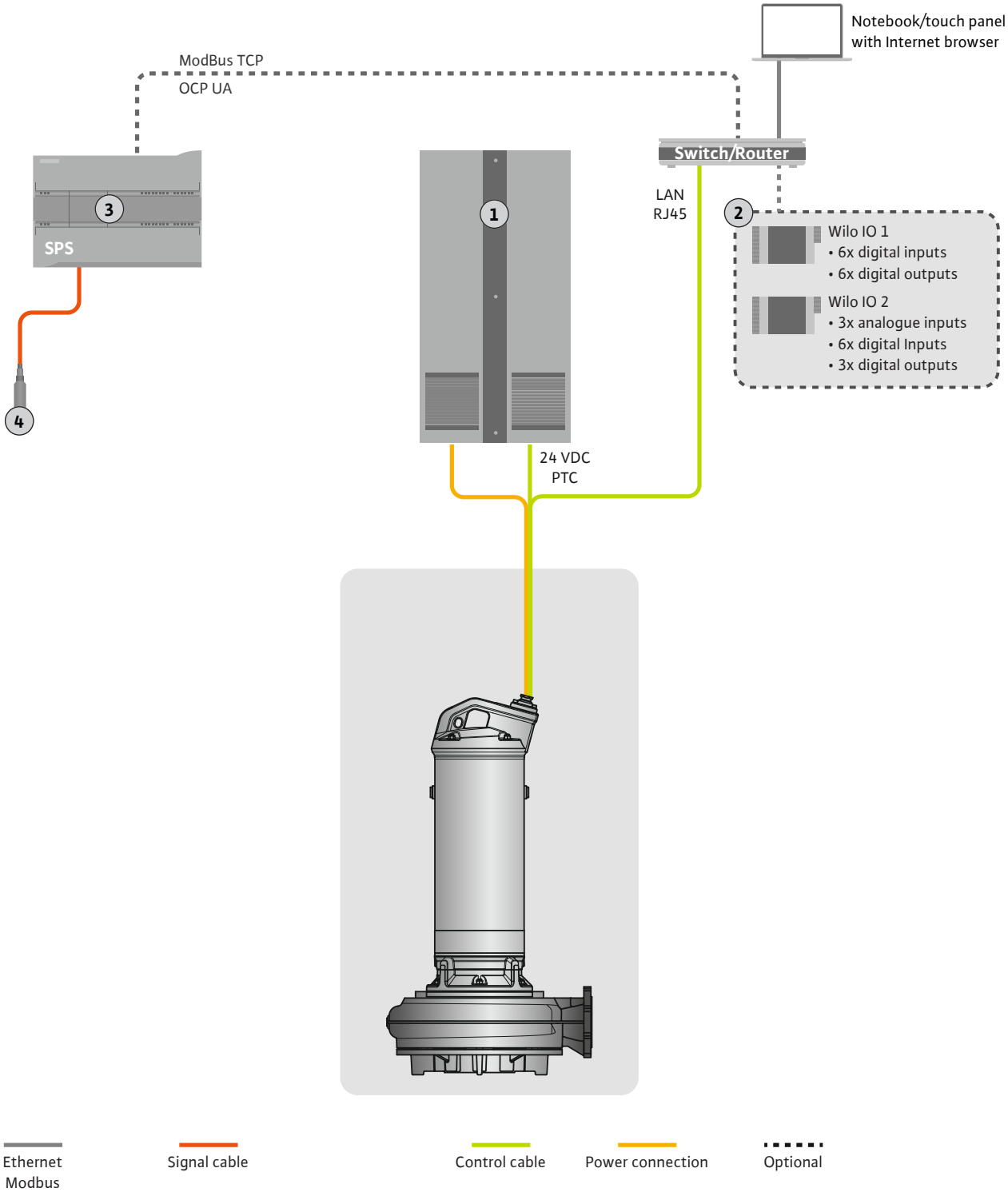


Fig. 2: Installation suggestion

1	Switch cabinet
2	I/O modules with digital and analogue inputs/outputs
3	Operator-side, primary control
4	Level sensor

4.4.1 Pump mains connection

Connect the motor to the on-site switching system. Please refer to the manufacturer's instructions for data about the activation type and motor connection!

NOTICE! Widely position cable shielding!

4.4.2 Digital Data Interface power supply connection

Connect the Digital Data Interface power supply to the on-site switching system:
→ Operating voltage: 24 VDC (12-30 V FELV, max. 4.5 W)
→ Wire 1: +
→ Wire 2: -

4.4.3 Connecting PTC sensors to the motor winding

Pt100 or Pt1000 sensors installed in the motor winding are used for thermal motor monitoring as part of software. View and adjust current temperature values and configure limit temperatures with the user interface. PTC sensors installed in the hardware define the maximum winding temperature and switch off the motor in an emergency.

CAUTION! Perform a functional check! Check the resistance prior to connecting the PTC sensor. Use an ohmmeter to measure the temperature sensor's resistance. PTC sensors have a cold resistance between 60 and 300 ohm.

Connecting the PTC sensor to the on-site switching system:
→ Operating voltage: 2.5 to 7.5 VDC
→ Wires: 3 and 4
→ Evaluation relay for PTC sensor, e.g. for enhancing the "MCB 112" Wilo-EFC PTC thermistor board or "CM-MSS" relay

DANGER

Risk of explosion due to incorrect connection!

There is a risk of fatal injury within potentially explosive atmosphere if thermal motor monitoring has been connected incorrectly! The connection must always be carried out by a qualified electrician. If used in potentially explosive atmospheres:

- Connect 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 once the unlock key has been actuated by hand!

4.4.4 Network connection

Prepare the network control cable and install the enclosed RJ45 plug. Connect to a network socket.

4.5 LPI system mode

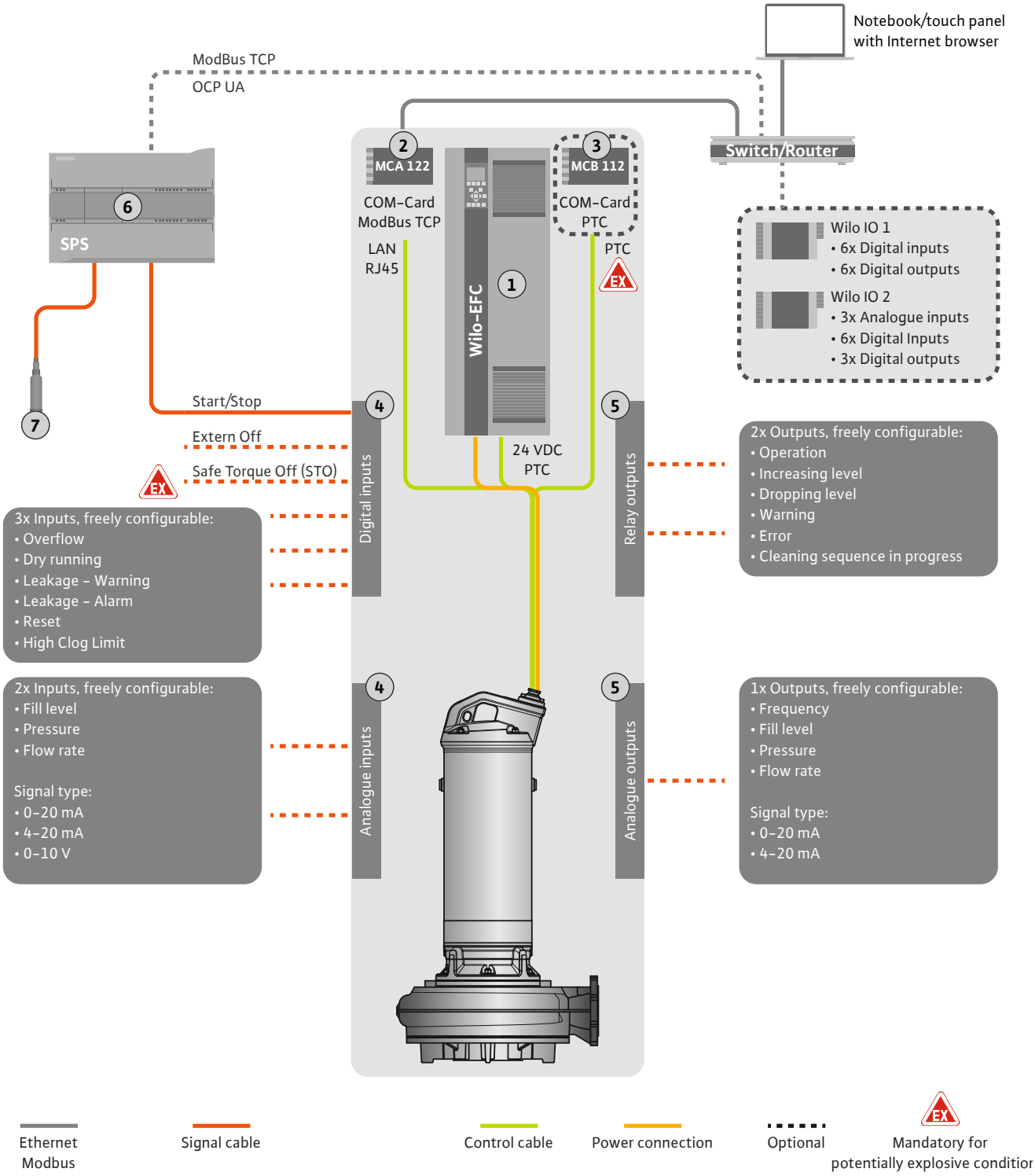


Fig. 3: Installation suggestion with start/stop

1	Frequency converter
2	"MCA 122" extension module for frequency converter (included in scope of delivery)
3	"MCB 112" extension module for frequency converter
4	Inputs at frequency converter
5	Outputs at frequency converter
6	Operator-side, primary control
7	Level sensor

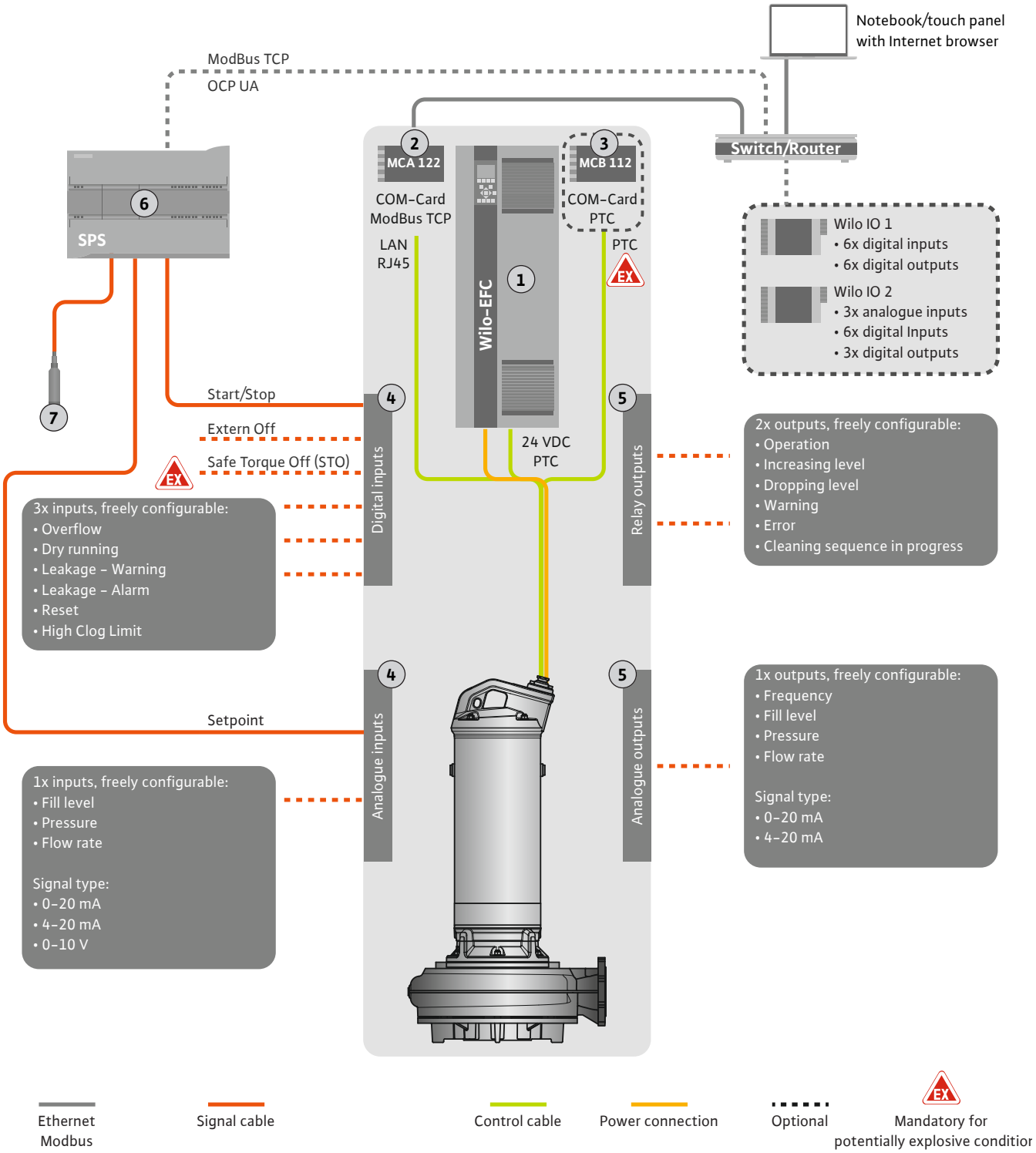


Fig. 4: Installation suggestion with analogue setpoint specifications

1	Frequency converter
2	"MCA 122" extension module for frequency converter (included in scope of delivery)
3	"MCB 112" extension module for frequency converter
4	Inputs at frequency converter
5	Outputs at frequency converter
6	Operator-side, primary control
7	Level sensor

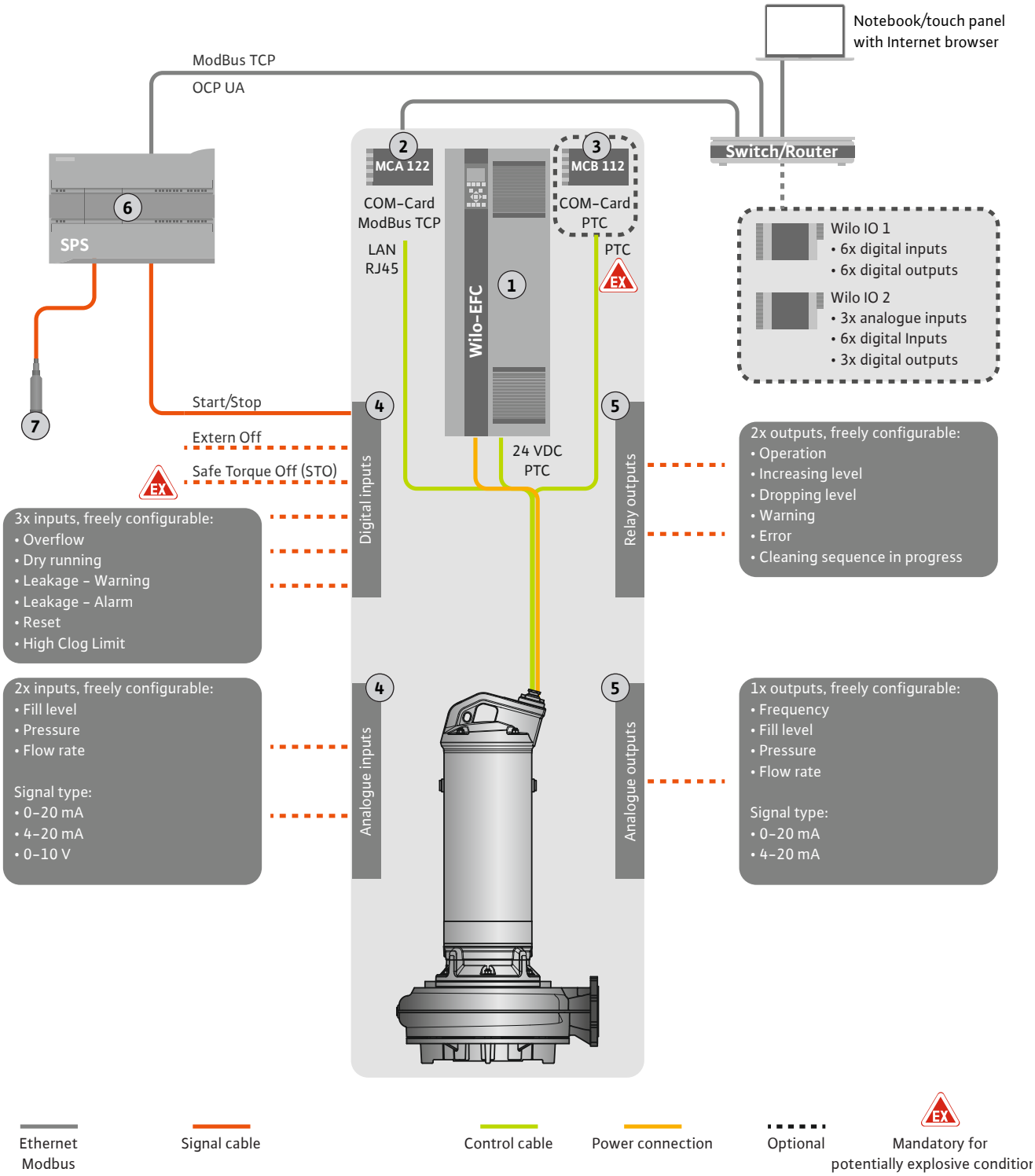


Fig. 5: Installation suggestion with ModBus

1	Frequency converter
2	"MCA 122" extension module for frequency converter (included in scope of delivery)
3	"MCB 112" extension module for frequency converter
4	Inputs at frequency converter
5	Outputs at frequency converter
6	Operator-side, primary control
7	Level sensor

4.5.1 Mains connection, pump

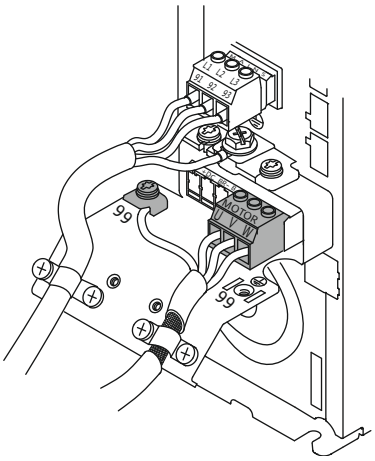


Fig. 6: Pump connection: Wilo-EFC

Wilo-EFC frequency converter

Terminal	Wiring diagram
96	U
97	V
98	W
99	Earth (PE)

Insert the motor connection cables into the frequency converter through the threaded cable gland. Connect the wires as per the connection diagram.

NOTICE! Widely position cable shielding!

4.5.2 Digital Data Interface power supply connection

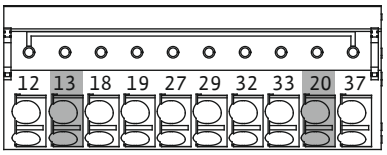


Fig. 7: Wilo-EFC terminal

Wilo-EFC frequency converter

Terminal	Control cable wire	Description
13	1	Power supply: +24 VDC
20	2	Power supply: Reference potential (0 V)

4.5.3 Connecting PTC sensors to the motor winding

Wilo-EFC frequency converter

DANGER

Risk of fatal injury due to incorrect connection!

If the pump is used in explosive atmospheres, observe chapter "Electrical connection in potentially explosive atmospheres"!

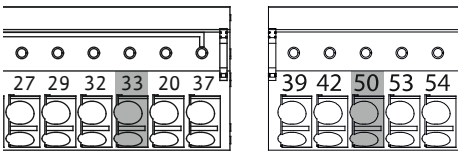


Fig. 8: Wilo-EFC terminal

Terminal	Control cable wire	Description
50	3	+10 VDC power supply
33	4	Digital input: PTC/WSK

Pt100 or Pt1000 sensors installed in the motor winding are used for thermal motor monitoring as part of software. View and adjust current temperature values and configure limit temperatures with the user interface. PTC sensors installed in the hardware define the maximum winding temperature and switch off the motor in an emergency.

CAUTION! Perform a functional check! Check the resistance prior to connecting the PTC sensor. Use an ohmmeter to measure the temperature sensor's resistance. PTC sensors have a cold resistance between 60 and 300 ohm.

4.5.4 Network connection

Wilo-EFC frequency converter

Prepare the network control cable and install the enclosed RJ45 plug. Connect to a network socket, e.g. at the "MCA 122" Ethernet module.

4.5.5 Connecting digital inputs

Note the following when connecting digital inputs:
→ Use shielded cables.

→ The unit automatically configures parameters during initial commissioning. Individual digital inputs are pre-assigned as part of this process. It is not possible to modify pre-assignments!
→ Assign the corresponding function in the Digital Data Interface to guarantee correct functionality of freely configurable inputs.

DANGER

Risk of fatal injury due to incorrect connection!

If the pump is used in explosive atmospheres, observe chapter "Electrical connection in potentially explosive atmospheres"!

NOTICE

Observe the manufacturer's instructions!

For more information, read and comply with the frequency converter instructions.

Frequency converter: Wilo-EFC

→ Input voltage: +24 VDC, terminal 12 and 13
→ Reference potential (0 V): Terminal 20

Terminal	Function	Contact type
18	Start	Normally open contact (NO)
27	External off	Normally closed contact (NC)
37	Safe Torque Off (STO)	Normally closed contact (NC)
19, 29, 32	Freely configurable	

Description of preassigned input functions:

→ Start
Input/output signal from primary control. **NOTICE! If the input is not required, install a converter bridge between terminals 12 and 18!**

→ External off
Remote deactivation using a separate switch. **NOTICE! The input directly switches over the frequency converter!**

→ Safe Torque Off (STO) – safe deactivation **NOTICE! If the input is not required, install a converter bridge between terminals 12 and 27!**
Hardware shutdown of the pump by the frequency converter, independent of the pump control. Automatic reactivation is not possible (reactivation lock). **NOTICE! If the input is not required, install a converter bridge between terminals 12 and 37!**

It is possible to assign the following functions to available inputs at the Digital Data Interface:

→ High Water
Signal for overflow level.

→ Dry Run
Signal for dry-running protection.

→ Leakage Warn
Signal for external sealing chamber monitoring. A warning message is output in the event of a fault.

→ Leakage Alarm
Signal for external sealing chamber monitoring. The pump is shut down in the event of a fault. Modify the alarm type in the configuration to define the downstream response.

→ Reset
External signal to reset error messages.

→ High Clogg Limit
Activating higher tolerance ("Power Limit - High") for clogging detection.

Contact type for the corresponding function

Function	Contact type
High Water	Normally open contact (NO)

Function	Contact type
Dry Run	Normally closed contact (NC)
Leakage Warn	Normally open contact (NO)
Leakage Alarm	Normally open contact (NO)
Reset	Normally open contact (NO)
High Clogg Limit	Normally open contact (NO)

4.5.6 Connecting analogue inputs

Note the following when connecting analogue inputs:
- → Use shielded cables.
- → You can freely configure the corresponding functions for analogue inputs. Assign corresponding functions in the Digital Data Interface!

NOTICE

Observe the manufacturer's instructions!

For more information, read and comply with the frequency converter instructions.

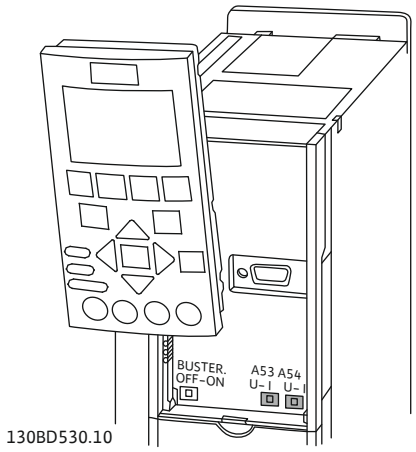


Fig. 9: Position for switches A53 and A54

Wilo-EFC frequency converter
- → Supply voltage: 10 VDC, 15 mA or 24 VDC, 200 mA
- → Terminals: 53, 54
  The individual connection depends on the installed sensor type. **CAUTION! Note the manufacturer's instructions on information about how to correctly connect the unit!**
- → Measurement range: 0...20 mA, 4...20 mA or 0...10 V.
  Additionally adjust the signal type (voltage (U) or current (I)) using two switches at the frequency converter. The two switches (A53 and A54) are located below the frequency converter display. **NOTICE! Also adjust the measurement range in the Digital Data Interface!**

It is possible to assign the following functions to the Digital Data Interface:
- → External Control Value
  Setpoint specification to control the pump speed as part of an analogue signal from primary control.
- → Level
  Recording the current fill level to record data. Basis for the "Increasing" and "Dropping" level functions at the digital output.
- → Pressure
  Recording the current system pressure to record data.
- → Flow
  Recording the current flow rate to record data.

4.5.7 Relay output connection

Note the following when connecting relay outputs:
- → Use shielded cables.
- → You can freely configure the corresponding functions for relay outputs. Assign corresponding functions in the Digital Data Interface!

NOTICE

Observe the manufacturer's instructions!

For more information, read and comply with the frequency converter instructions.

Wilo-EFC frequency converter
- → 2x type C relay outputs. **NOTICE! Note the manufacturer instructions for exact relay output positioning!**
- → Switching capacity: 240 VAC, 2 A
  A higher switching capacity can be applied at relay output 2 on the NO contact (terminal: 4/5): max. 400 VAC, 2 A

Terminal	Contact type
Relay output 1	
1	Centre terminal (COM)
2	Normally open contact (NO)
3	Normally closed contact (NC)
Relay output 2	
4	Centre terminal (COM)
5	Normally open contact (NO)
6	Normally closed contact (NC)

It is possible to assign the following functions to the Digital Data Interface:
- → Run
  Individual run signal of the pump
- → Rising Level
  Message for increasing level.
- → Falling Level
  Message for dropping level.
- → Warning
  Individual fault signal of the pump: Warning.
- → Error
  Individual fault signal of the pump: Alarm.
- → Cleaning
  Message when the cleaning sequence of the pump is started.

4.5.8 Connecting analogue outputs

Note the following when connecting the analogue output:
- → Use shielded cables.
- → You can freely configure the corresponding functions for the output. Assign corresponding functions in the Digital Data Interface!

NOTICE

Observe the manufacturer's instructions!

For more information, read and comply with the frequency converter instructions.

Wilo-EFC frequency converter
- → Terminal: 39/42
- → Measurement range: 0...20 mA or 4...20 mA
  NOTICE! Also adjust the measurement range in the Digital Data Interface!

It is possible to assign the following functions to the Digital Data Interface:
- → Frequency
  Current actual frequency output.
- → Level
  Current fill level output. **NOTICE! For output, connect a corresponding signal transmitter to an input!**
- → Pressure
  Current operating pressure output. **NOTICE! For output, connect a corresponding signal transmitter to an input!**
- → Flow
  Display of the current flow quantity. **NOTICE! For output, connect a corresponding signal transmitter to an input!**

4.5.9 Connection input/output extensions (LPI mode)

NOTICE

Take note of additional literature!

To ensure proper use, additionally read and observe the manufacturer instructions.

	Wilo IO 1	Wilo IO 2
General		
Type	ET-7060	ET-7002
Mains connection	10 ... 30 VDC	10 ... 30 VDC
Operating temperature	-25 ... +75 °C	-25 ... +75 °C
Dimensions (WxLxH)	72x123x35 mm	72x123x35 mm
Digital inputs		
Number	6	6
Voltage level "On"	10 ... 50 VDC	10 ... 50 VDC
Voltage level "Off"	max. 4 VDC	max. 4 VDC
Relay outputs		
Number	6	3
Contact type	Normally open contact (NO)	Normally open contact (NO)
Switching capacity	5 A, 250 VAC/24 VDC	5 A, 250 VAC/24 VDC
Analogue inputs		
Number	–	3
Configurable measurement range	–	Yes, with jumper
Potential measurement ranges	–	0 ... 10 V, 0 ... 20 mA, 4 ... 20 mA

Please refer to the manufacturer's instructions for all further technical data.

Installation

NOTICE! Refer to the manufacturer's instructions for any information on how to change the IP address and installation!

1. Adjust the signal type (current or voltage) for the measurement range: Install the jumper.
   NOTICE! Adjust the measurement range in the Digital Data Interface and send to the I/O module. Do not set the measurement range in I/O module.
2. Secure the module in the switch cabinet.
3. Connect inputs and outputs.
4. Connect the mains connection.
5. Configure the IP address.
6. Configure the type of I/O module used in the Digital Data Interface.

I/O module overview

Terminal 1 ... 7	Digital inputs
Terminal 8	Mains connection (+)
Terminal 9	Mains connection (-)
Terminal 12 ... 23	Relay outputs, normally open contact (NO)

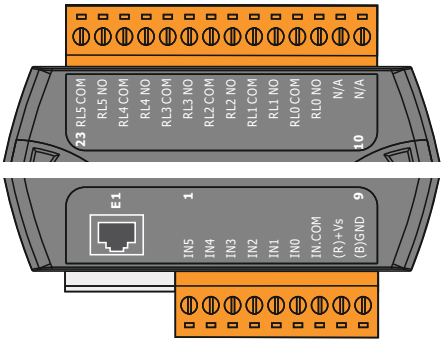


Fig. 10: Wilo IO 1 (ET-7060)

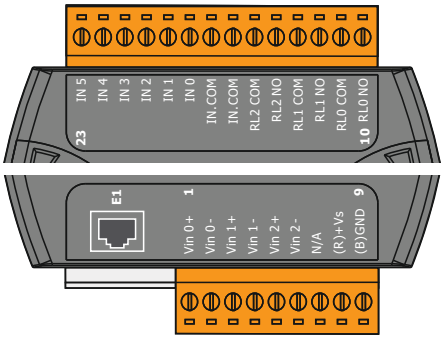


Fig. 11: Wilo IO 2 (ET-7002)

Terminal 1 ... 6	Analogue inputs
Terminal 8	Mains connection (+)
Terminal 9	Mains connection (-)
Terminal 10 ... 15	Relay outputs, normally open contact (NO)
Terminal 16 ... 23	Digital inputs

Input and output functions

It is possible to assign the same functions to the inputs and outputs and the frequency converter. **NOTICE! Connected inputs and outputs at the Digital Data Interface!** ("Settings ➔ I/O Extension")

4.6 LSI system mode

In the "LSI" system mode, the pumping station is completely controlled via the Digital Data Interface. Here, a system consists of at least the following products:

- → Up to four pumps, each pump with Digital Data Interface and own frequency converter
- → An I/O2 module
- → A level sensor for the setpoint specification

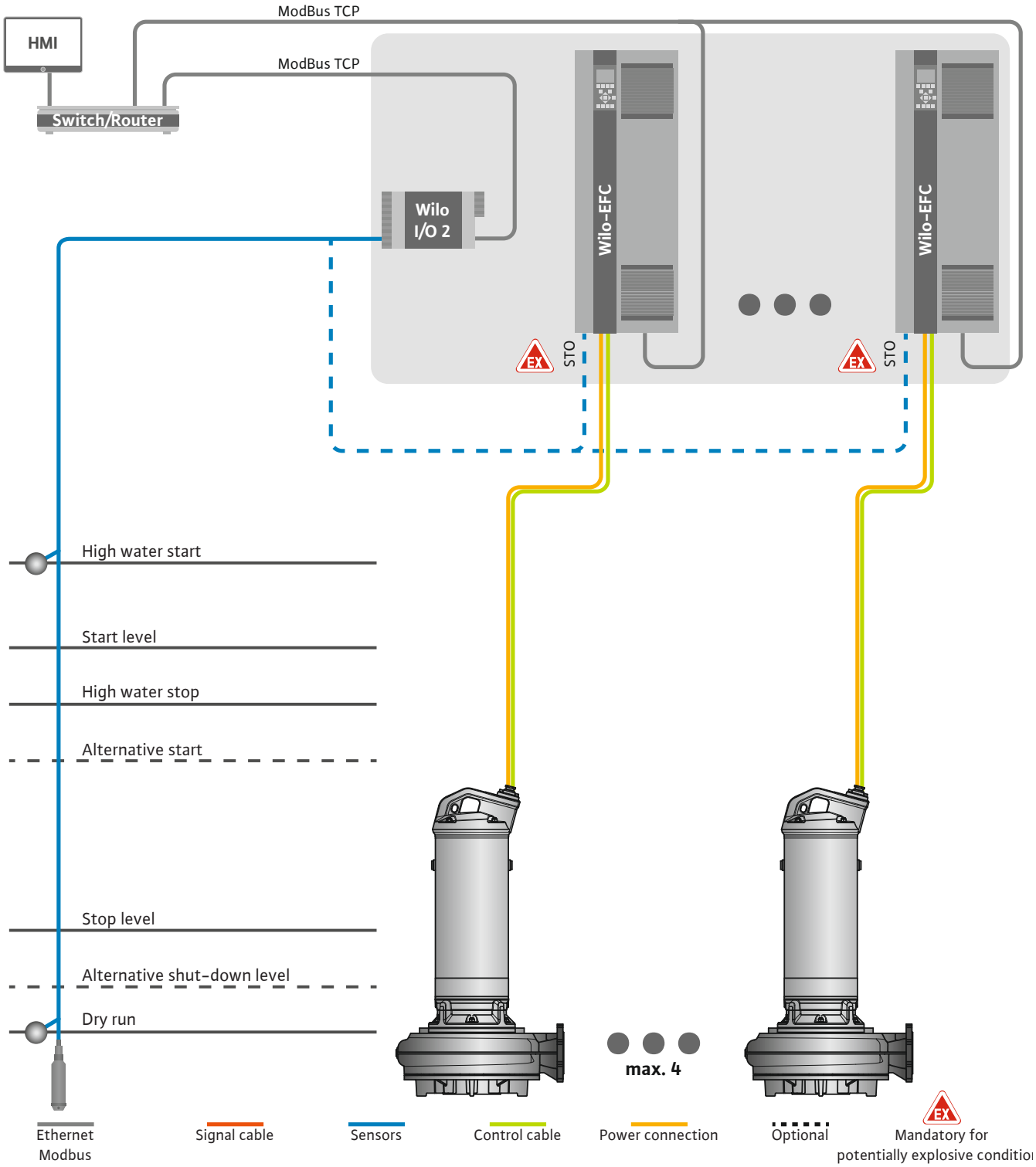


Fig. 12: Connection of LSI system mode: System overview

Here, the pumping station works autonomously and does not require a higher-level control system. For limited interaction with a higher-level controller, various functions are available at the outputs or via fieldbus:

- → System approval
- → Signalling of faults and warnings

→ Transfer of measured values

CAUTION! An intervention of the higher-level control system outside the defined channels can cause the system to malfunction!

The cross-system parameters for sensors and control triggers are centrally connected to the I/O module. The corresponding functions are assigned via the Digital Data Interface.

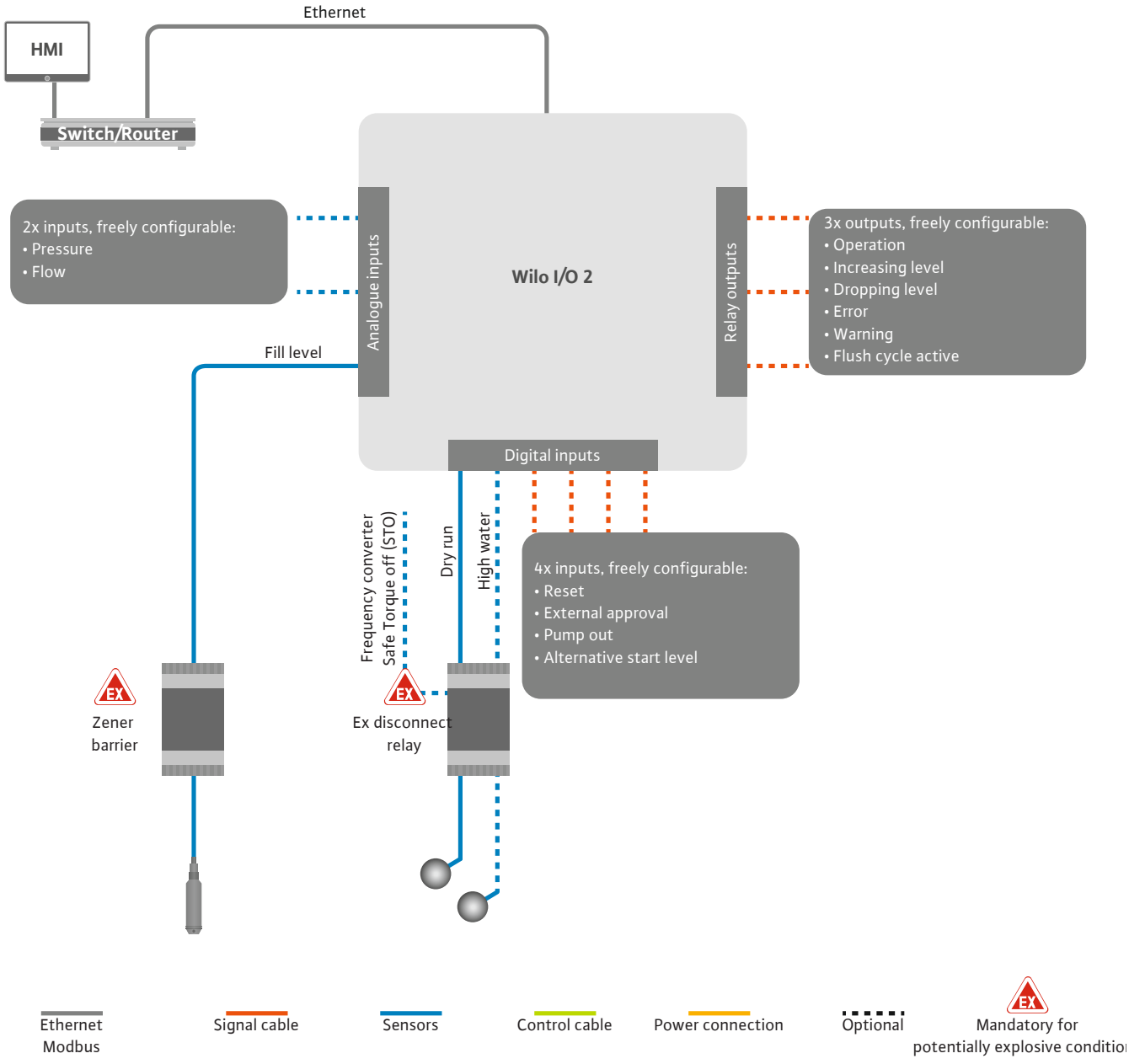


Fig. 13: Connection of LSI system mode: I/O2 module

The pump parameters (operating and fault messages) for the single pump are recorded via the frequency converter. In addition, current measured values can be output via the frequency converter. The functions are assigned via the Digital Data Interface.

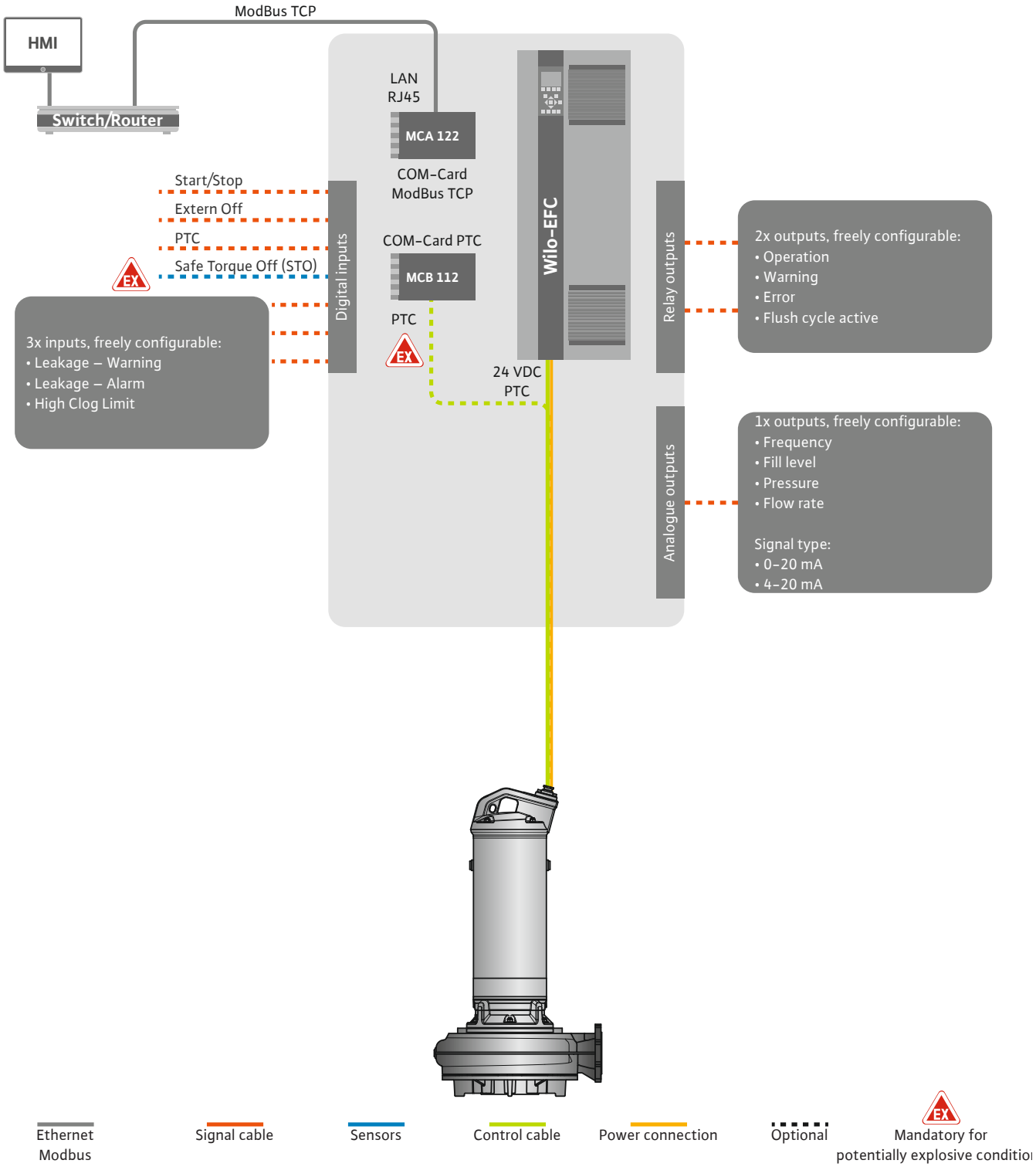


Fig. 14: Connection of LSI system mode: Frequency converter

CAUTION! Always use the digital inputs "Start/Stop", "External off" and "Safe Torque Off". If the inputs are not needed, install a converter bridge!

4.6.1 Control modes

The individual pumps work according to the Master/Slave principle. This is where each pump is set individually via the Slave home page. The higher-level Master home page is used to set the system-dependent parameters:

- → Operating Mode – switch system on and off, define control mode.
- → System Limits – define system limits.
- → Basic settings for the control modes:
  - – Level Controller
  - – PID
  - – High Efficiency(HE) Controller

All pumps in the system are controlled by the set parameters. The master pump is redundant in the system. If the current master pump fails, the master function is transferred to another pump.

4.6.1.1 Control mode: Level Controller

Up to six switching levels can be defined. The number of pumps and the desired operating frequency are set for each switching level.

4.6.1.2 Control mode: PID Controller

With PID control, the setpoint can be related to a constant flow, fill level or pressure in the system. The controlled output frequency is the same for all connected pumps. Based on the setpoint deviation and the output frequency, a pump is switched on or off after a time delay.

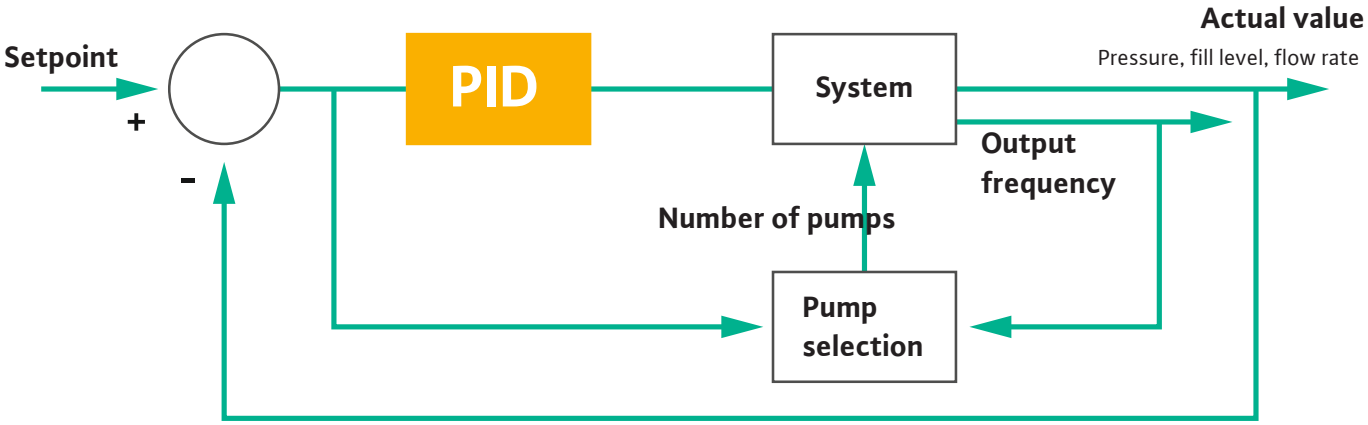


Fig. 15: Control loop with PID controller

NOTICE! A level sensor must always be present in the system for PID control. For a setpoint specification for pressure or flow measurement, an appropriate sensor must also be provided!

The PID controller consists of three parts:

- → Proportional
- → Integral
- → Differential.

"FMIN/FMAX" refers to the specification of the Min/Max Frequency in the system limits.

Control conditions

If both conditions apply for a defined duration, a pump is switched on:

- → Setpoint deviation is outside the defined limit.
- → Output frequency reaches the **maximum** frequency.

If both conditions apply for a defined duration, a pump is switched off:

- → Setpoint deviation is outside the defined limit.
- → Output frequency reaches the **minimum** frequency.

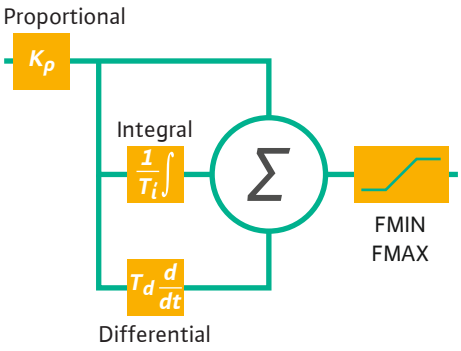


Fig. 16: PID controller

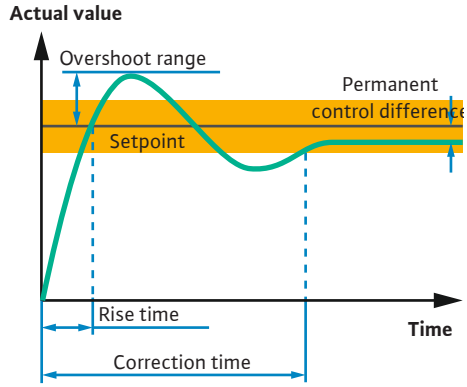


Fig. 17: Step response of a control loop

The following figure explains the control function. The following table clearly shows the dependencies of the individual components.

Step response of a control loop	Rise time	Overshoot range	Correction time	Permanent control difference
Proportional	Decrease	Increase	Small change	Decrease
Integral	Decrease	Increase	Increase	Eliminate
Differential	Small change	Decrease	Decrease	Small change

Table 1: Influence of the proportional, integral and differential components on the step response of a control loop

4.6.1.3 Control mode: High Efficiency(HE) Controller

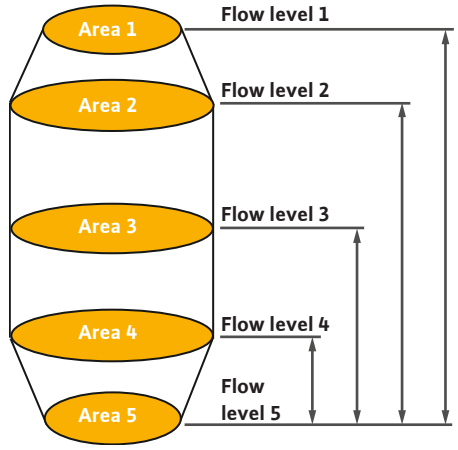


Fig. 18: HE controller: Illustration of chamber geometry

The HE controller enables energy-efficient control of the speed-adjustable sewage pumps. Using the level measurement, the operating frequency is constantly calculated, which is then transferred to the frequency converter. For calculating the operating frequency, the boundary conditions of the system are always considered:

→ Control parameters
→ Piping parameters
→ Chamber geometry

The HE controller controls only one active pump. All other pumps in the system are regarded as standby pumps. During pump cycling, all existing pumps are taken into account.

To ensure operational reliability, the system curve is constantly monitored. If the system curve diverges significantly from the target state, countermeasures are initiated.

NOTICE! To calculate the system curve, flow measurements for different frequencies are required. If the pumping station has no flow meters, the flow rates are calculated.

How is the HE controller activated?

To activate the HE controller, set the following parameters in the Digital Data Interface:

1. Set control parameters.
2. Set piping parameters.
3. Calculate piping. The calculation takes approx. 1 ... 3 minutes.
4. Store chamber geometry.

► The measurement of the system curve is automatically started with the next pump start.

► For more information regarding the settings, refer to the chapter "Extended initial commissioning for the LSI system mode".

Measurement of the system curve

Four frequencies are preferably used for the measurement. These are equidistant frequencies between the minimum and rated frequency. Here, each frequency is used twice for 3 minutes. To ensure that the system curve is always up to date, a measurement is taken every day. Special features during the measurement:

→ If the inlet flow is very high, the next frequency is selected just as high to match this. This ensures that the inlet flow is managed.
→ If you reach the stop level, the measurement is continued during the next pumping sequence.

Pump operation at optimum frequency

After the system curve has been measured, the calculation of the energetically optimal frequency, i.e. the operating frequency with the lowest power consumption per cubic meter conveyed, is taken. This operating frequency is used for the next pumping se-

quences. If the inlet flow becomes greater than the volume flow, the control system intervenes:

→ The operating frequency is increased until the volume flow is slightly lower than the inlet flow. This ensures that the pump chamber is filled up to the start level slowly.
→ When you reach the start level, the volume flow is equal to the inlet flow. This keeps the flow level in the pump chamber constant.
→ The control now reacts depending on the fill level:
  – When the fill level drops, the pump is operated again at the calculated operating frequency. The pump chamber is drained to the stop level.
  – If the fill level exceeds the start level, the pump is operated at rated frequency. The pump chamber is drained to the stop level. The calculated operating frequency will only be used again with the next draining sequence!

Sedimentation

The pipeline diameter is also monitored during the pumping sequence. If the pipeline diameter becomes too small due to deposits (sedimentation), a flush cycle is started at rated frequency. The flush cycle is terminated as soon as the set limit value is reached.

4.6.2 System-dependent framework parameters

Various system-dependent framework parameters are stored in the system limits:

→ High water start and stop level
→ Dry-running protection level
→ **Alternative switch-on level**
  The "alternative switch-on level" is an additional switch-on level to the previous pump out of the pump chamber. This earlier switch-on level increases the standby chamber volume for special events, e.g. heavy rain. To activate the additional switch-on level, apply a trigger to the I/O module.
→ **Alternative shut-down level**
  The "alternative shut-down level" is an additional shut-down level for lowering the fill level in the pump chamber or for aerating the level sensor. The additional shut-down level is activated automatically after a defined number of pump cycles is reached. The level value must be between the shut-down and dry-running protection level.
→ Minimum and maximum operating frequency
→ Dry run sensor source
→ ...

4.6.3 Mains connection, pump

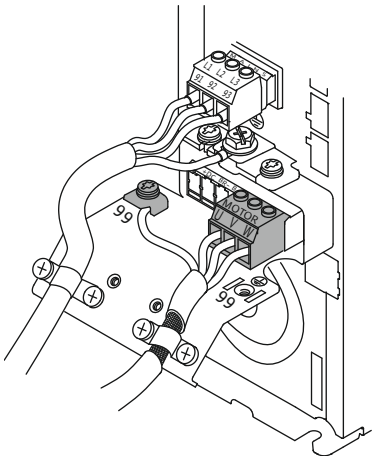


Fig. 19: Pump connection: Wilo-EFC

Wilo-EFC frequency converter

Terminal	Wiring diagram
96	U
97	V
98	W
99	Earth (PE)

Insert the motor connection cables into the frequency converter through the threaded cable gland. Connect the wires as per the connection diagram.

NOTICE! Widely position cable shielding!

4.6.4 Connecting PTC sensors to the motor winding

Wilo-EFC frequency converter

DANGER

Risk of fatal injury due to incorrect connection!

If the pump is used in explosive atmospheres, observe chapter "Electrical connection in potentially explosive atmospheres"!

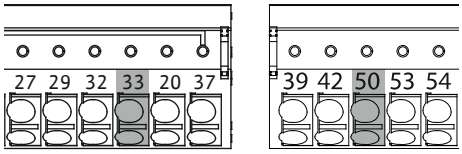


Fig. 20: Wilo-EFC terminal

Terminal	Control cable wire	Description
50	3	+10 VDC power supply
33	4	Digital input: PTC/WSK

Pt100 or Pt1000 sensors installed in the motor winding are used for thermal motor monitoring as part of software. View and adjust current temperature values and configure limit temperatures with the user interface. PTC sensors installed in the hardware define the maximum winding temperature and switch off the motor in an emergency.

CAUTION! Perform a functional check! Check the resistance prior to connecting the PTC sensor. Use an ohmmeter to measure the temperature sensor's resistance. PTC sensors have a cold resistance between 60 and 300 ohm.

4.6.5 Network connection

Wilo-EFC frequency converter

Prepare the network control cable and install the enclosed RJ45 plug. Connect to a network socket, e.g. at the "MCA 122" Ethernet module.

4.6.6 Connecting digital inputs

Note the following when connecting digital inputs:

- → Use shielded cables.
- → The unit automatically configures parameters during initial commissioning. Individual digital inputs are pre-assigned as part of this process. It is not possible to modify pre-assignments!
- → Assign the corresponding function in the Digital Data Interface to guarantee correct functionality of freely configurable inputs.

DANGER

Risk of fatal injury due to incorrect connection!

If the pump is used in explosive atmospheres, observe chapter "Electrical connection in potentially explosive atmospheres"!

NOTICE

Observe the manufacturer's instructions!

For more information, read and comply with the frequency converter instructions.

Frequency converter: Wilo-EFC

- → Input voltage: +24 VDC, terminal 12 and 13
- → Reference potential (0 V): Terminal 20

Terminal	Function	Contact type
18	Start	Normally open contact (NO)
27	External off	Normally closed contact (NC)
37	Safe Torque Off (STO)	Normally closed contact (NC)
19, 29, 32	Freely configurable	

Description of preassigned input functions:

- → Start
  Not needed in LSI system mode. **Install converter bridge between terminals 12 and 18!**

→ External off
Not needed in LSI system mode. **Install converter bridge between terminals 12 and 27!**

→ Safe Torque Off (STO) – safe deactivation
Hardware shutdown of the pump by the frequency converter, independent of the pump control. Automatic reactivation is not possible (reactivation lock). **NOTICE! If the input is not required, install a converter bridge between terminals 12 and 37!**

It is possible to assign the following functions to available inputs at the Digital Data Interface:

→ Leakage Warn
Signal for external sealing chamber monitoring. A warning message is output in the event of a fault.

→ Leakage Alarm
Signal for external sealing chamber monitoring. The pump is shut down in the event of a fault. Modify the alarm type in the configuration to define the downstream response.

→ High Clogg Limit
Activating higher tolerance ("Power Limit – High") for clogging detection.

Functions "High Water", "Dry Run" and "Reset" are connected to the I/O module and assigned in the Digital Data Interface!

Contact type for the corresponding function

Function	Contact type
Leakage Warn	Normally open contact (NO)
Leakage Alarm	Normally open contact (NO)
High Clogg Limit	Normally open contact (NO)

4.6.7 Relay output connection

Note the following when connecting relay outputs:

→ Use shielded cables.

→ You can freely configure the corresponding functions for relay outputs. Assign corresponding functions in the Digital Data Interface!

NOTICE

Observe the manufacturer's instructions!

For more information, read and comply with the frequency converter instructions.

Wilo-EFC frequency converter

→ 2x type C relay outputs. **NOTICE! Observe the manufacturer instructions for exact relay output positioning!**

→ Switching capacity: 240 VAC, 2 A
A higher switching capacity can be applied at relay output 2 on the NO contact (terminal: 4/5): max. 400 VAC, 2 A

Terminal	Contact type
Relay output 1	
1	Centre terminal (COM)
2	Normally open contact (NO)
3	Normally closed contact (NC)
Relay output 2	
4	Centre terminal (COM)
5	Normally open contact (NO)
6	Normally closed contact (NC)

It is possible to assign the following functions to the Digital Data Interface:

→ Run
Individual run signal of the pump

→ Error

Individual fault signal of the pump: Alarm.

→ Warning
Individual fault signal of the pump: Warning.

→ Cleaning
Message when the cleaning sequence of the pump is started.

Functions "Rising Level" and "Falling Level" are connected to the I/O module and assigned in the Digital Data Interface!

4.6.8 Connecting analogue outputs

Note the following when connecting the analogue output:
→ Use shielded cables.
→ You can freely configure the corresponding functions for the output. Assign corresponding functions in the Digital Data Interface!

NOTICE

Observe the manufacturer's instructions!

For more information, read and comply with the frequency converter instructions.

Wilo-EFC frequency converter

→ Terminal: 39/42
→ Measurement range: 0...20 mA or 4...20 mA
NOTICE! Also adjust the measurement range in the Digital Data Interface!

It is possible to assign the following functions to the Digital Data Interface:

→ Frequency
Current actual frequency output.

→ Level
Current fill level output. **NOTICE! For output, connect a corresponding signal transmitter to an input!**

→ Pressure
Current operating pressure output. **NOTICE! For output, connect a corresponding signal transmitter to an input!**

→ Flow
Display of the current flow quantity. **NOTICE! For output, connect a corresponding signal transmitter to an input!**

4.6.9 Connection input/output extensions (LSI mode)

NOTICE

Take note of additional literature!

To ensure proper use, additionally read and observe the manufacturer instructions.

	Wilo IO 2
General	
Type	ET-7002
Mains connection	10 ... 30 VDC
Operating temperature	-25 ... +75 °C
Dimensions (WxLxH)	72x123x35 mm
Digital inputs	
Number	6
Voltage level "On"	10 ... 50 VDC
Voltage level "Off"	max. 4 VDC
Relay outputs	
Number	3
Contact type	Normally open contact (NO)

	Wilo IO 2
Switching capacity	5 A, 250 VAC/24 VDC
Analogue inputs	
Number	3
Configurable measurement range	Yes, with jumper
Potential measurement ranges	0 … 10 V, 0 … 20 mA, 4 … 20 mA

Please refer to the manufacturer's instructions for all further technical data.

Installation

NOTICE! Refer to the manufacturer's instructions for any information on how to change the IP address and installation!

1. Adjust the signal type (current or voltage) for the measurement range: Install the jumper.
   NOTICE! Adjust the measurement range in the Digital Data Interface and send to the I/O module. Do not set the measurement range in I/O module.
2. Secure the module in the switch cabinet.
3. Connect inputs and outputs.
4. Connect the mains connection.
5. Configure the IP address.
6. Configure the type of I/O module used in the Digital Data Interface.

Overview I/O 2 module

Terminal 1 … 6	Analogue inputs
Terminal 8	Mains connection (+)
Terminal 9	Mains connection (-)
Terminal 10 … 15	Relay outputs, normally open contact (NO)
Terminal 16 … 23	Digital inputs

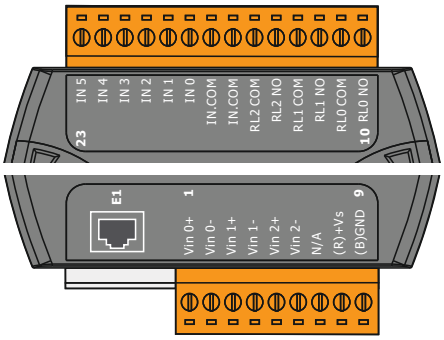


Fig. 21: Wilo IO 2 (ET-7002)

Inputs and outputs

NOTICE! Assign connected inputs and outputs in the Digital Data Interface to the master pump! ("Settings ➔ I/O Extension")

The following functions can be assigned to the **digital** inputs:

→ High Water
Signal for overflow level.

→ Dry Run
Signal for dry-running protection.

→ Reset
External signal to reset error messages.

→ System Off
External signal to switch off the system.

→ Trigger Start Level
Start drainage pumping sequence. Pump chamber is drained to the switch-off level.

→ Alternative Start Level
Activate alternative switch-on level.

The following functions can be assigned to the **analogue** inputs:

NOTICE! Assign function "fill level" to the analogue input for the level sensor!

→ External Control Value
Setpoint specification from a higher-level control system to the control of the pumping station as an analogue signal. **NOTICE! In LSI system mode, the pumping**

station operates autonomously from a higher-level control system. If the set-point specification must be made by a higher-level control system, please contact customer service!

→ Level
Setpoint specification for the control modes in LSI system mode.

NOTICE! Requirements for the LSI system mode! Assign this function to an input.

→ Pressure
Recording the current system pressure to record data.

NOTICE! Can be used as control value for the PID controller!

→ Flow
Recording the current flow rate to record data.

NOTICE! Can be used as control value for the PID and HE controller!

The following functions can be assigned to the **relay outputs**:

→ Run
Collective run signal

→ Rising Level
Message for increasing level.

→ Falling Level
Message for dropping level.

→ System Error
Collective fault signal: Error.

→ System Warning
Collective fault signal: Warning.

→ Cleaning
Message when a cleaning sequence of a pump is active.

4.7 Electrical connection in potentially explosive atmospheres

DANGER

Risk of fatal injury due to incorrect connection!

If the pump is installed within potentially explosive atmospheres, connect dry-running protection and thermal motor monitoring to "Safe Torque Off"!

- Observe the instructions of the frequency converter!
- Observe all instructions in this chapter!

If the pump is installed within potentially explosive atmospheres, observe the following points:

Signal transmitter

→ Install separate signal transmitter for dry-running protection.
→ Connect float switch via Ex cut-off relay.
→ Connect level sensors via Zener barrier.

Wilo-EFC frequency converter

→ Install PTC thermistor card "MCB 112".
Observe the instructions of the frequency converter and the PTC thermistor card!

LSI system mode: install one card per frequency converter!

→ Connect the PTC sensor to the PTC thermistor card "MCB 112":
Terminals T1 and T2

→ Connect PTC thermistor card "MCB 112" to "Safe Torque Off (STO)":
– PTC thermistor card "MCB 112" Terminal 10 to terminal 33 on the frequency converter.
– PTC thermistor card "MCB 112" Terminal 12 to terminal 37 on the frequency converter.

→ Connect dry-running protection additionally to the PTC thermistor card "MCB 112".
Terminals 3 to 9

DANGER! LSI system mode: Connect dry-running protection to all frequency converters!

5 Operation

NOTICE

Automatic activation after power cut

Depending on the process, the product is switched on and off using separate controls. The product may automatically switch on following power cuts.

5.1 System requirements

The following components are required to configure and commission the pump:

- → Computer with Windows, Macintosh or Linux operating systems with Ethernet connection
- → Internet browser to access the user interface. The following Internet browsers are supported:
  - Firefox 65 or more recent
  - Google Chrome 60 or more recent
  - Other Internet browsers may be affected by restricted illustration!
- → Ethernet network: 10BASE-T/100BASE-TX

5.2 User accounts

The Digital Data Interface features two user accounts:

- → Anonymous user
  Standard user account without password to display settings. It is **not** possible to change settings.
- → Regular user
  User account with password to configure settings.
  - User name: user
  - Password: user
    Log in using the sidebar menu. Users are automatically logged off after 2 minutes.

NOTICE! Change the default password during the initial configuration for security reasons!

NOTICE! Contact customer service if you have misplaced the new password! Customer service can restore the default password.

5.3 Operating elements

Drop-down menu

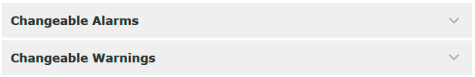


Fig. 22: Drop-down menu

Click a menu item to expand it. It is only ever possible to show one menu at the time. Click another menu item to close any expanded menu item.

On/off switch

Fig. 23: On/off switch

Click the switch to switch the function on or off:

- → "Grey" switch: Function **off**.
- → "Green" switch: Function **on**.

Selection field

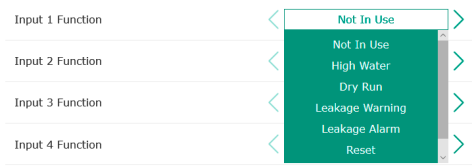


Fig. 24: Selection field

There are two options to select items:

- → Use the two arrows on the left and right to browse values.
- → Click the field to open the value list. Click the selected value.

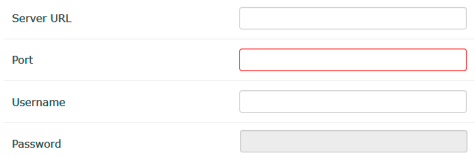


Fig. 25: Text field

Text field

You can directly input the corresponding value in text fields. Text field illustration depends on the input:

- White text field
  You **can** input or change the corresponding value.
- White text field with red edge
  Mandatory field! You **must** input the corresponding value.
- Grey text field
  Text input disabled. Value is inserted automatically or log in to change the value.

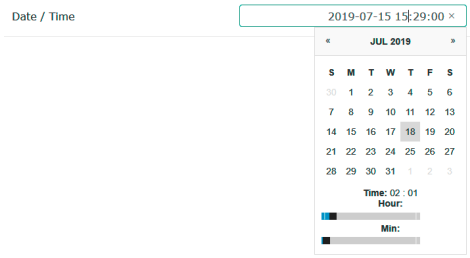


Fig. 26: Date/time

Date and time

Set the date and time using the selection field if the date and time are not synchronised using the NTP protocol. Click the input field to set the date and time:

- Select and click the date in the calendar.
- Set the time using the sliders.

5.4 Transferring input/changes

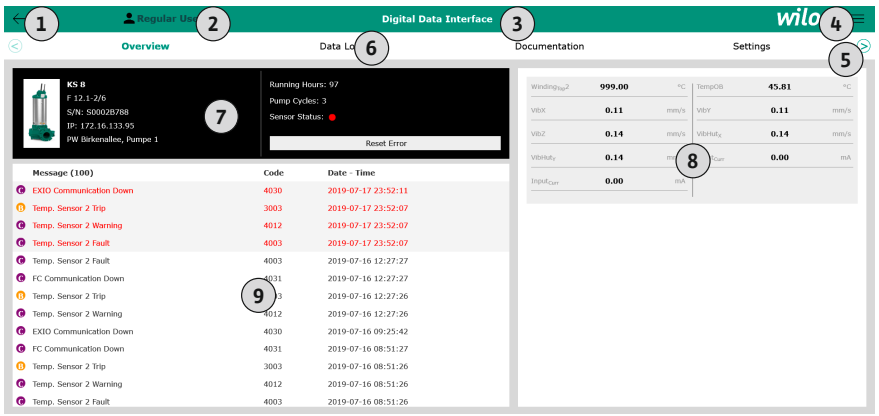
Any input and changes in the corresponding menus are not automatically transferred:

- Click "Save" in the corresponding menu to transfer input and changes.
- Select a different menu or change to the start screen to discard input or changes.

5.5 Start screen

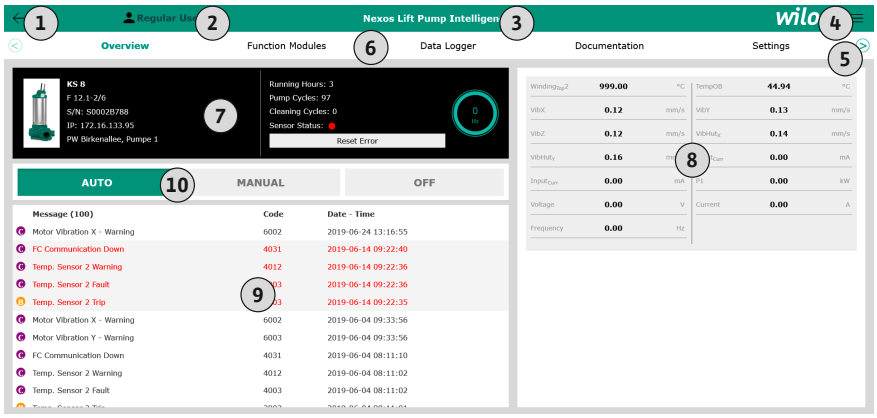
The Digital Data Interface is accessed and controlled in an Internet browser using a graphical user interface. The home page opens after entering the IP address. The home page lists all important pump or pumping station information at a glance. It also provides access to the main menu and user login. The display of the home page varies depending on the selected system mode.

5.5.1 Home page: DDI system mode



1	Back
2	User that has logged in
3	Software licence/system mode
4	Sidebar menu
5	Browse main menu
6	Main menu
7	Pump data
8	Sensor values
9	Error protocol

5.5.2 Home page: LPI system mode



1	Back
2	User that has logged in
3	Software licence/system mode
4	Sidebar menu
5	Browse main menu
6	Main menu
7	Pump data
8	Sensor values
9	Error protocol
10	Pump operating mode

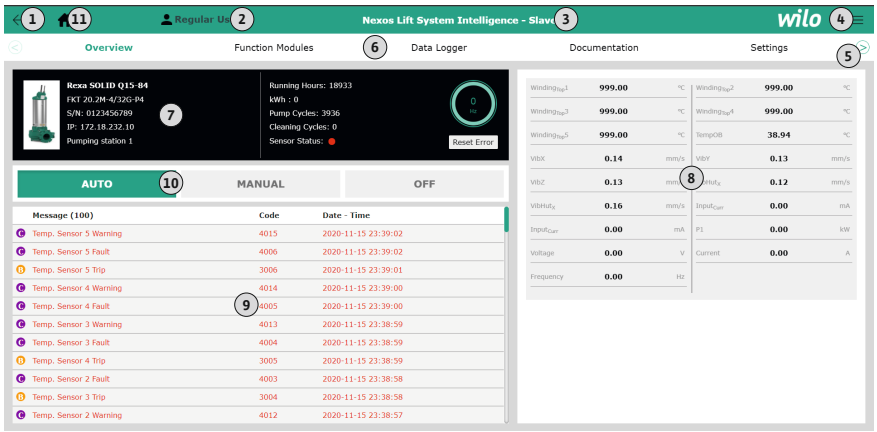
5.5.3 Home page: LSI system mode

In LSI system mode, there are two different home pages:

→ Slave home page
Each pump has its own home page. The current operating data of the pump can be viewed via this home page. This home page is also used to configure the pump.

→ Master home page
The system has a higher–level Master home page. The operating parameters of the pumping station and the individual pumps are displayed here. In addition, the control parameters of the pumping station are set via this home page.

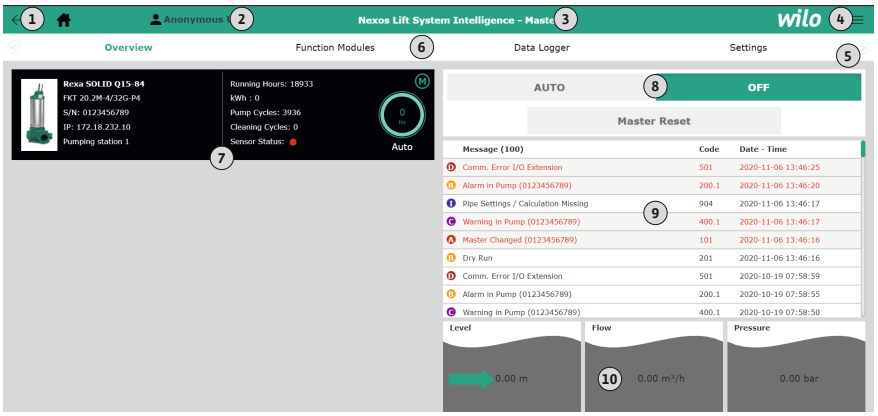
Slave home page



1	Back
2	User that has logged in
3	Software licence/system mode
4	Sidebar menu
5	Browse main menu
6	Main menu
7	Pump data
8	Sensor values
9	Error log for the pump
10	Pump operating mode

11	Go to Master home page.

Master home page



1	Back
2	User that has logged in
3	Software licence/system mode
4	Sidebar menu
5	Browse main menu
6	Main menu
7	Display of existing pumps in the system with pump data
8	Operating mode of the system
9	Error log for the system
10	Operating data for the pumping station

5.5.4 Pump data

The following pump data is displayed depending on the configured system mode:

Pump data	System mode			
	DDI	LPI	LSI master	LSI slave
Pump type	•	•	•	•
Motor type	•	•	•	•
IP address	•	•	•	•
Installation name	•	•	•	•
Operating hours	•	•	•	•
Pump cycles	•	•	•	•
Cleaning cycles	–	•	•	•
Sensor status	•	•	•	•
Operating frequency	–	•	•	•
Pump operating mode	–	•	•	•

Key
– = Not available, • = Available

5.5.5 Sensor values

The following sensors can be displayed depending on the configured system mode and installed motor:

Description	Display	System mode		
		DDI	LPI	LSI slave
Winding temperature 1	Winding 1	•	•	•
Winding temperature 2	Winding 2	o	o	o
Winding temperature 3	Winding 3	o	o	o
Bearing temperature, top	Bearing 4	o	o	o
Bearing temperature, bottom	Bearing 5	o	o	o

Description	Display	System mode		
		DDI	LPI	LSI slave
Digital Data Interface temperature sensor	TempOB	•	•	•
Digital Data Interface vibration sensor	VibX, VibY, VibZ	•	•	•
Motor bearing vibration sensor	MotX, MotY	o	o	o
Leakage, sealing chamber	L.SC	o	o	o
Leakage, leakage chamber	L.LC	o	o	o
Power consumption	P1	–	•	•
Rated voltage	Voltage	–	•	•
Rated current	Current	–	•	•
Frequency	Frequency	–	•	•

Key
– = Not available, o = Optional, • = Available

NOTICE! Only installed sensors are displayed. List varies depending on the installed motor.

5.5.6 Pump operating mode

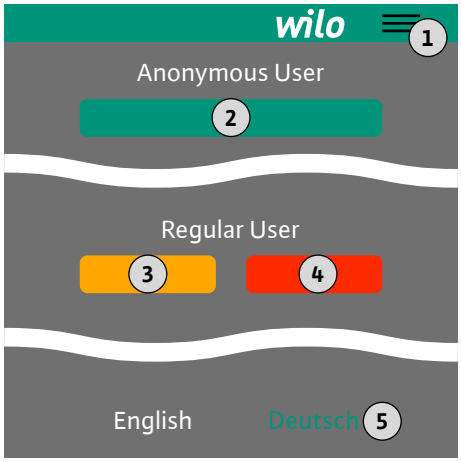
Controll the pump directly from the start screen in "LPI" and "LSI" system modes:

→ Off
Pump off.

→ Manual
Switch on pump by hand. The pump runs until the "Off" button has been clicked or the switch-off level has been reached.
NOTICE! Enter a frequency for the duty point for manual operation! (See menu: "Function Modules ➔ Operating Mode ➔ Frequency in Manual Mode")
NOTICE! "LSI" system mode: manual operation is only possible if the master operating mode is "off"!

→ Auto
Automatic operation of the pump.
"LPI" system mode: Setpoint specification using primary control.
"LSI" system mode: Setpoint specification by the system master.

5.6 Sidebar menu



1	Hiding/expanding the sidebar menu
2	"Login" (green button)
3	"Edit profile" (yellow button)
4	"Logout" (red button)
5	Selecting the menu language – the currently configured language has been highlighted in green.

Click the hamburger icon to expand or hide the sidebar menu. Access the following functions using the sidebar menu:

→ User management
- Shows the user that is currently logged in: Anonymous user or Regular user
- Logging in users: click "Login".
- Logging off users: click "Logout".
- Changing the user password: "Edit profile".

→ Menu language
Click the desired language.

6 Configuration

6.1 Operator responsibilities

→ Provides the installation and operating instructions in the personnel's language.
→ Make sure that the installation and operating instructions have been read and understood by all personnel.
→ Safety devices and precautions (incl. emergency off) for the entire system are switched on and have been checked for problem-free operation.

6.2 Personnel qualifications

Operating personnel must meet the following prerequisites to configure and operate pumps:

- → Safe handling of web-based, English user interfaces
- → Specialist language skills, particularly in English, for the following specialist areas
  - – Electrical engineering, specialising in frequency converters
  - – Pump technology, specialising in operating pump systems
  - – Network technology, configuring network components

6.3 Prerequisites

The following prerequisites must have been met to be able to configure the Digital Data Interface:

Prerequisite	System mode		
	DDI	LPI	LSI
Network			
Ethernet network: 10BASE-T/100BASE-TX, IP-based, with DHCP server*	•	•	•
IP address of the frequency converter Verified from the DHCP server* by default. Refer to the manufacturer instructions for information on how to assign a fixed IP address!	–	•	•
IP address of the I/O module I/O module has been assigned a fixed IP address by default. Note the manufacturer instructions to change this IP address!	o	o	•
User interface			
Computer with Windows, Macintosh or Linux operating system, Ethernet connection and installed Internet browser**	•	•	•

Key
– = Not required, o = If required, • = Mandatory

***Network without DHCP server**
Digital Data Interface has been set to DHCP by default. Consequently, all required network parameters are access using the DHCP server. There must be a DHCP server in the network for the initial configuration. Consequently, it is possible to permanently configure the required IP addresses for operation without DHCP server.

****Supported Internet browser**
The following Internet browsers are supported:

- → Firefox 65 or more recent
- → Google Chrome 60 or more recent

6.4 Initial configuration

Below are step-by-step instructions for the different system modes. You must ensure the below points have been implemented before following the step-by-step instructions:

- → All necessary electrical connections have been made.
- → A fixed IP address has been defined for each component.
- → Notebook or touch panel is available to access the web-based user interface (Web-HMI).

NOTICE

Users must log in to configure settings!

Users must log in using the sidebar menu:
- User name: user
- Password: user

The default password is changed as part of initial configuration!

6.4.1 Initial configuration: System mode "DDI"

Define a fixed IP address for the following components before starting the initial commissioning:

- → Pump
- → Notebook/touch panel (Web HMI)

Configure pump

1. Connect pump to DHCP server.

   There **must** be a DHCP server in the network for the initial configuration. Digital Data Interface has been set to DHCP by default. Consequently, all required network parameters are accessed using the DHCP server.

2. Set the IP address and subnet of the pump to the specified network configuration.

   Settings ➜ Digital Data Interface ➜ Network Interface Settings Network Interface Settings [▶ 138]

3. Reconnect to the set IP address.

4. "Regular user" user account: change the default password.

   Open sidebar menu and change user profile. Changing the default password for the "Regular User" user account [▶ 137]

5. Set the time/date.

   Set the correct time and date to correctly log all changes in the Digital Data Interface.

   Settings ➜ Clock Clock [▶ 137]

6. Set the language.

   Settings ➜ Menu Language Menu Language [▶ 137]

6.4.2 Initial configuration: System mode "LPI"

Define a fixed IP address for the following components before starting the initial commissioning:
→ I/O module (if available)
→ Frequency converter
→ Pump
→ Notebook/touch panel (Web HMI)

Configure I/O module (if available)

1. Set signal type of the analogue inputs at the I/O module (set jumper to current or voltage input).

2. Set IP address and subnet of the I/O module to the specified network configuration.

   See installation and operating instructions of the I/O module.

3. Connect the I/O module to the network.

NOTICE! Apart from the IP address, the I/O module requires no further software settings!

Configure frequency converter

1. Connect the frequency converter to the network.

2. Set the IP address and subnet of the frequency converter to the specified network configuration.

   See installation and operating instructions of the frequency converter: Parameters 12-0

3. Set operating mode of the frequency converter to "Off".

   See installation and operating instructions of the frequency converter: Press the Off key on the operating part.

Configure pump

1. Connect pump to DHCP server.

   There **must** be a DHCP server in the network for the initial configuration. Digital Data Interface has been set to DHCP by default. Consequently, all required network parameters are accessed using the DHCP server.

2. Set the IP address and subnet of the pump to the specified network configuration.

   Settings ➜ Digital Data Interface ➜ Network Interface Settings [▶ 138]

3. Reconnect to the set IP address.

4. "Regular user" user account: change the default password.

Open sidebar menu and change user profile. Changing the default password for the "Regular User" user account [▶ 137]

5. Set the time/date.

   Set the correct time and date to correctly log all changes in the Digital Data Interface.

   Settings ➔ Clock [▶ 137]

6. Set the language.

   Settings ➔ Menu Language [▶ 137]

7. Set the system mode of the pump to "LPI".

   Settings ➔ Digital Data Interface ➔ System Mode Selection [▶ 139]

   NOTICE! Wait until the page updates!

8. Set type and IP address of the frequency converter in the Digital Data Interface.

   Settings ➔ Frequency Converter ➔ IP / Type Select [▶ 141]

9. Carry out auto-parameterisation.

   Settings ➔ Frequency Converter ➔ Auto Setup [▶ 141]

10. Set ramp times of the frequency converter in the Digital Data Interface.

    Settings ➔ Frequency Converter ➔ Ramp Settings [▶ 141]

11. Assign functions to the inputs/outputs of the frequency converter in the Digital Data Interface.

    Settings ➔ Frequency Converter ➔ Digital Inputs [▶ 141]

    Settings ➔ Frequency Converter ➔ Analog Inputs [▶ 142]

    Settings ➔ Frequency Converter ➔ Relay Outputs [▶ 143]

    Settings ➔ Frequency Converter ➔ Analog Outputs [▶ 143]

12. Start "Automatic motor adjustment" on the frequency converter.

    See installation and operating instructions of the frequency converter: Parameters 1-29

    CAUTION! Carry out complete "automatic motor adjustment". Reduced "automatic motor adjustment" can lead to wrong results!

    NOTICE! After carrying out the "automatic motor adjustment", check the number of poles of the motor: Parameters 1-39!

13. Set type and IP address of the I/O module in the Digital Data Interface (if available).

    Settings ➔ I/O Extension ➔ IP / Type Select [▶ 144]

14. Assign functions to I/O module inputs/outputs in the Digital Data Interface.

    Settings ➔ I/O Extension ➔ Digital Inputs [▶ 144]

    Settings ➔ I/O Extension ➔ Analog Inputs [▶ 145] (only Wilo I/O 2)

    Settings ➔ I/O Extension ➔ Relay Outputs [▶ 145]

Activate pump

1. Set frequency converter to "automatic mode".

   See installation and operating instructions of the frequency converter: Press the Auto On key on the operating part.

2. Set pump to "automatic mode".

   Function Modules ➔ Operating Mode (Pump) [▶ 148]

3. To be able to use the clogging detection, calibrate the reference curve.

   Function Modules ➔ Clog Detection ➔ Clog Detection - Teach Power Curve [▶ 148]

6.4.3 Initial configuration: System mode "LSI"

Define a fixed IP address for the following components before starting the initial commissioning:

- → I/O module
- → For each frequency converter
- → For each pump
- → Master-IP for system access

→ Notebook/touch panel (Web HMI)

Configure I/O module

1. Set signal type of the analogue inputs at the I/O module (set jumper to current or voltage input).
2. Set IP address and subnet of the I/O module to the specified network configuration.

   See installation and operating instructions of the I/O module.
3. Connect the I/O module to the network.

NOTICE! Apart from the IP address, the I/O module requires no further software settings!

Configure frequency converter 1 … 4

NOTICE! Repeat steps 1 – 3 for each frequency converter!

1. Connect the frequency converter to the network.
2. Set the IP address and subnet of the frequency converter to the specified network configuration.

   See installation and operating instructions of the frequency converter: Parameters 12-0
3. Set operating mode of the frequency converter to "Off".

   See installation and operating instructions of the frequency converter: Press the Off key on the operating part.

Configure pump 1 … 4

NOTICE! Repeat steps 1 – 13 for each pump!

1. Connect pump to DHCP server.

   There **must** be a DHCP server in the network for the initial configuration. Digital Data Interface has been set to DHCP by default. Consequently, all required network parameters are accessed using the DHCP server.
2. Set the IP address and subnet of the pump to the specified network configuration.

   Settings ➔ Digital Data Interface ➔ Network Interface Settings [▸ 138]
3. Reconnect to the set IP address.
4. "Regular user" user account: change the default password.

   Open sidebar menu and change user profile. Changing the default password for the "Regular User" user account [▸ 137]
5. Set the time/date.

   Set the correct time and date to correctly log all changes in the Digital Data Interface.

   Settings ➔ Clock [▸ 137]
6. Set the language.

   Settings ➔ Menu Language [▸ 137]
7. Set the system mode of the pump to "LSI".

   Settings ➔ Digital Data Interface ➔ System Mode Selection [▸ 139]

   NOTICE! Wait until the page updates!

   In "LSI" system mode, the settings and functions are divided into master and slave. Observe the overview of the Settings [▸ 136] and Function modules [▸ 147].
8. Assign pump to system.

   Settings ➔ Digital Data Interface ➔ LSI Mode System Settings [▸ 139]

   NOTICE! Enter the same master IP address for each pump!
9. Set type and IP address of the frequency converter in the Digital Data Interface.

   Settings ➔ Frequency Converter ➔ IP / Type Select [▸ 141]
10. Carry out auto-parameterisation.

    Settings ➔ Frequency Converter ➔ Auto Setup [▸ 141]
11. Set ramp times of the frequency converter in the Digital Data Interface.

Settings ➜ Frequency Converter ➜ Ramp Settings [▶ 141]

12. Assign functions to the inputs/outputs of the frequency converter in the Digital Data Interface.

    Settings ➜ Frequency Converter ➜ Digital Inputs [▶ 141]

    Settings ➜ Frequency Converter ➜ Relay Outputs [▶ 143]

    Settings ➜ Frequency Converter ➜ Analog Outputs [▶ 143]

13. Start "Automatic motor adjustment" on the frequency converter.

    See installation and operating instructions of the frequency converter: Parameters 1-29

    CAUTION! Carry out complete "automatic motor adjustment". Reduced "automatic motor adjustment" can lead to wrong results!

    NOTICE! After carrying out the "automatic motor adjustment", check the number of poles of the motor: Parameters 1-39!

Configure system settings

1. Open the **master home page** of the system.

   Enter the Master-IP address or click on the house icon on the Slave home page.

2. Check settings for time/date.

   Settings ➜ Clock [▶ 137]

3. Check language settings.

   Settings ➜ Menu Language [▶ 137]

4. Set the type and IP address of the I/O module in the Digital Data Interface.

   Settings ➜ I/O Extension ➜ IP / Type Select [▶ 144]

5. Assign functions to I/O module inputs/outputs in the Digital Data Interface.

   Settings ➜ I/O Extension ➜ Digital Inputs [▶ 144]

   Settings ➜ I/O Extension ➜ Analog Inputs [▶ 145]

   Settings ➜ I/O Extension ➜ Relay Outputs [▶ 145]

6. Select control mode: Auto Mode Selection

   Function Modules ➜ Operating Mode ➜ Operating Mode (System) [▶ 150]

7. Set the system limits.

   Function Modules ➜ System Limits ➜ Levels [▶ 151]

   Function Modules ➜ System Limits ➜ Dry Run Sensor Selection [▶ 151]

   Function Modules ➜ System Limits ➜ Pump Limits and Changer [▶ 151]

   Function Modules ➜ System Limits ➜ Min/Max Frequency [▶ 152]

8. Configure parameters for control mode:
   - Level Control
     Function Modules ➜ Level Controller ➜ Stop Level [▶ 153]
     Function Modules ➜ Level Controller ➜ Level 1 ... 6 [▶ 153]
   - PID
     Function Modules ➜ PID Controller ➜ PID Settings [▶ 153]
     Function Modules ➜ PID Controller ➜ Controller Parameter [▶ 154]
   - HE-Controller
     Function Modules ➜ High Efficiency(HE) Controller ➜ Control Settings [▶ 155]
     Function Modules ➜ High Efficiency(HE) Controller ➜ Pipe Settings [▶ 155]
     NOTICE! If all information about the pipe is stored, carry out "Calculate piping"!
     Function Modules ➜ High Efficiency(HE) Controller ➜ Tank Geometry [▶ 156]

Activate pump

NOTICE! Repeat steps 1 – 4 for each pump and frequency converter!

1. Open the **slave home page** of the pump.
2. Set frequency converter to "automatic mode".

See installation and operating instructions of the frequency converter: Press the Auto On key on the operating part.

3. Set pump to "automatic mode".

   Function Modules ➔ Operating Mode (Pump) [▶ 148]

4. To be able to use the clogging detection, calibrate the reference curve.

   Function Modules ➔ Clog Detection ➔ Clog Detection – Teach Power Curve [▶ 148]

Activate system

1. Open the **master home page** of the system.
2. Set the system to "automatic mode": Operating Mode Selection

   Function Modules ➔ Operating Mode ➔ Operating Mode (System) [▶ 150]

6.5 Settings

NOTICE

Users must log in to configure settings!

Users must log in using the sidebar menu:
– User name: user
– Password: user
The default password is changed as part of initial configuration!

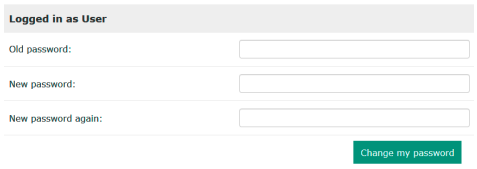
Overview of settings depending on the system mode.

Settings	System mode			
	DDI	LPI	LSI Master	LSI Slave
Menu Language	•	•	•	–
Clock	•	•	•	–
Units	•	•	–	•
Digital Data Interface				
Network Interface Settings	•	•	–	•
Proxy Settings	•	•	–	•
System Mode Selection	•	•	–	•
LPI Control Settings	–	•	–	–
LSI Mode System Settings	–	–	–	•
Limits Temperature Sensors	•	•	–	•
Limits Vibration Sensors	•	•	–	•
Frequency Converter				
IP / Type Select	–	•	–	•
Auto Setup	–	•	–	•
Ramp Settings	–	•	–	•
Digital Inputs	–	•	–	•
Analog Inputs	–	•	–	–
Relay Outputs	–	•	–	•
Analog Outputs	–	•	–	•
I/O Extension				
IP / Type Select	•	•	•	–
Digital Inputs	•	•	•	–
Analog Inputs (Wilo IO 2 only)	•	•	•	–
Relay Outputs	•	•	•	–
Alarm / Warning Types				

Settings	System mode			
	DDI	LPI	LSI Master	LSI Slave
Changeable Alarms	•	•	–	•
Changeable Warnings	•	•	–	•

Key
– = Not available, • = Available

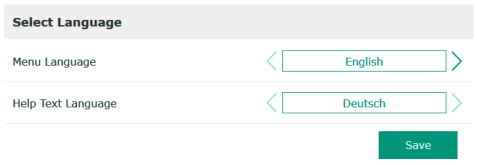
6.5.1 Changing the default password for the "Regular User" user account



Open the sidebar menu and click "Edit profile" to change the default password.
→ Old password: Enter the current password (default: "user")
→ New password: Enter new password:
  – Alphanumeric password with at minimum two digits.
  – Length: at minimum 6 characters, at maximum 10 characters.
→ New password again: Confirm the new password.
→ Click "Change my password" to transfer the new password.

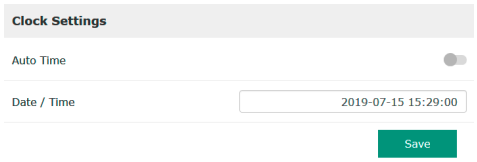
NOTICE! Contact customer service if you have misplaced the password! Customer service can restore the default password.

6.5.2 Menu Language



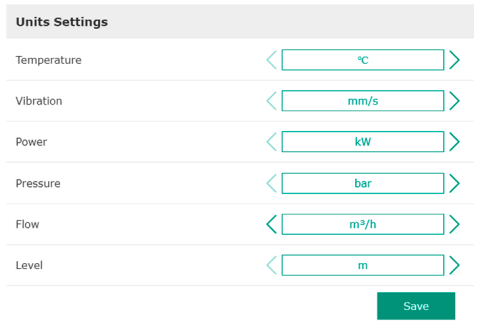
You can set separate languages for the menu and help texts.
→ Menu Language
  Factory setting: English
→ Help Text Language
  Factory setting: English

6.5.3 Clock



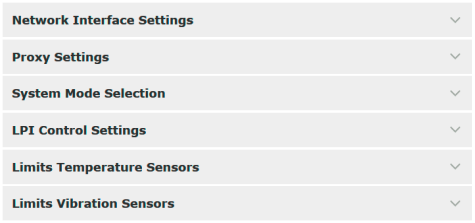
The date and time display can be synchronised or set manually via the NTP protocol.
→ Auto Time
  Time and date are synchronised via the NTP protocol. Enter the desired NTP server in the "Network Interface Settings" menu (see menu: Settings ➔ Digital Data Interface ➔ Network Interface Settings).
  Factory setting: On
→ Date / Time
  Deactivate the "Auto Time" function and click the field to manually set the time and date. A window opens with a calendar and two slide bars to set hours and minutes.

6.5.4 Units



Set the units:
→ Temperature
  Factory setting: °C
  Input: °C, °F
→ Vibration
  Factory setting: mm/s
  Input: mm/s, in/s
→ Power
  Factory setting: kW
  Input: kW, hp
→ Pressure
  Factory setting: bar
  Input: bar, psi
→ Flow
  Factory setting: l/s
  Input: l/s, m³/h, US.liq.gal/min
→ Level
  Factory setting: m
  Input: m, ft

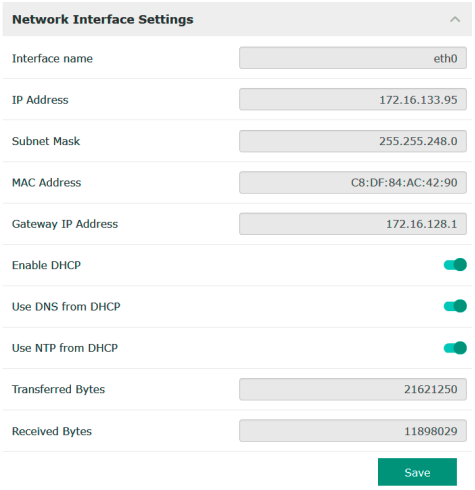
6.5.5 Digital Data Interface



Digital Data Interface basic settings:

- → Network Interface Settings
  Network communication settings
- → Proxy Settings
  Proxy server settings
- → System Mode Selection (visible to user that has logged in only)
  Selecting the desired system mode (DDI, LPI, LSI)
- → LPI Control Settings
  Setting for pump setpoint specification
- → Limits Temperature Sensors
  Limit values for warning and alarm
- → Limits Vibration Sensors
  Limit values for warning and alarm

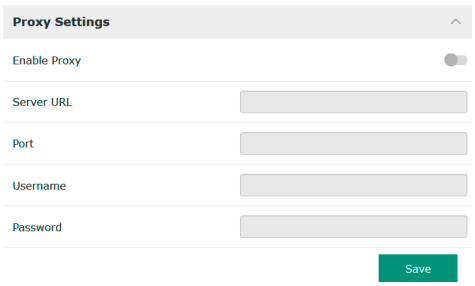
6.5.5.1 Network Interface Settings



Basic settings for the pump's network access to the local network.

- → Interface name
  Fixed name of the Ethernet interface.
- → IP Address
  IP address of the Digital Data Interface.
  Factory setting: transmitted via DHCP
- → Subnet Mask
  Digital Data Interface subnet mask.
  Factory setting: transmitted via DHCP
- → MAC Address
  Shows the MAC address.
- → Gateway IP Address
  IP address of the (router) gateway.
  Factory setting: transmitted via DHCP
- → Enable DHCP
  The local network settings are automatically transmitted via the DHCP protocol.
  Factory setting: On
  Enter the following information if the DHCP protocol is switched off:
  - IP Address
  - Subnet Mask
  - Gateway IP Address
  - Custom DNS
    CAUTION! If invalid values are entered, access to the pump will no longer be possible after saving!
- → Use DNS from DHCP
  The IP address of the DNS server is transmitted via the DHCP protocol.
  Factory setting: On
  Enter the IP address of the DNS server manually if this function or the DHCP protocol is switched off.
- → Custom DNS
  IP address of the DNS server.
- → Use NTP from DHCP
  The DHCP server transmits the current time and the date via the NTP protocol.
  Factory setting: On
  Enter the IP address/domain of the DNS server manually if this function or the DHCP protocol is switched off.
- → Custom NTP Server
  Address of the NTP server for time synchronisation.
  Factory setting: pool.ntp.org
- → Transferred Bytes/Received Bytes
  Shows of the transmitted and received data packages.

6.5.5.2 Proxy Settings



Basic settings for network access via a proxy server.

→ Enable Proxy
Factory setting: Off

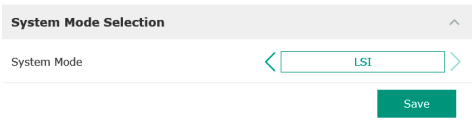
→ Server URL
Domain or IP address of the proxy server.

→ Port
Network port used to communicate with the server.

→ Username
Login name

→ Password
Login password

6.5.5.3 System Mode Selection



The control system comprises three different system modes: "DDI", "LPI" and "LSI". Potentially available system modes are enabled using the licence key. System modes are downward-compatible.

→ System Mode Selection
Factory setting: depends on licence
Input: DDI, LPI, LSI

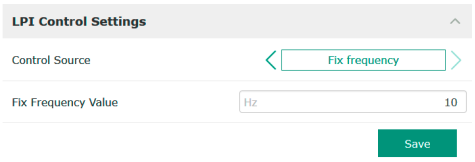
Description of the individual system modes:

→ DDI system mode
System mode with no control function. Only temperature and vibration sensor values are recorded, evaluated and saved. The pump and the frequency converter (if present) are controlled via the operator's primary control.

→ LPI system mode
System mode with control function for frequency converters and clogging detection. The pump/frequency converter pairing works as a unit: the frequency converter is controlled through the pump. This allows clogging detection to be carried out and, if necessary, a cleaning process to be started. Level-dependent control of the pump takes place via the operator's primary control.

→ LSI system mode
System mode for complete control of the pumping station with up to four pumps. In this process, one pump operates as the master and all other pumps are slaves. The master pump controls all other pumps depending on the system-specific parameters.

6.5.5.4 LPI Control Settings



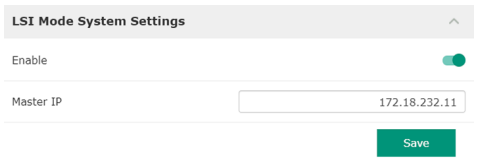
Basic settings for "LPI" system mode.

→ Control Source
Setpoint specification from the primary control.
Factory setting: Analog
Input: Analog, Bus, Fix frequency

- Analog
  Primary control values are transmitted to the frequency converter or an I/O module as analogue signals. **NOTICE! Configure an analogue input using the "Setpoint" value!**
- Bus
  Primary control values are sent to the pump using the Ethernet network. ModBus TCP or OPC UA are used as communication protocols.
- Fix frequency
  The pump runs at a fixed frequency.

→ Fix Frequency Value
In the "Control Source" setting, select the "Fix frequency" value enter the corresponding frequency.
Factory setting: 0 Hz
Input: 25 Hz to max. frequency (f_{op}) according to the rating plate

6.5.5.5 LSI Mode System Settings



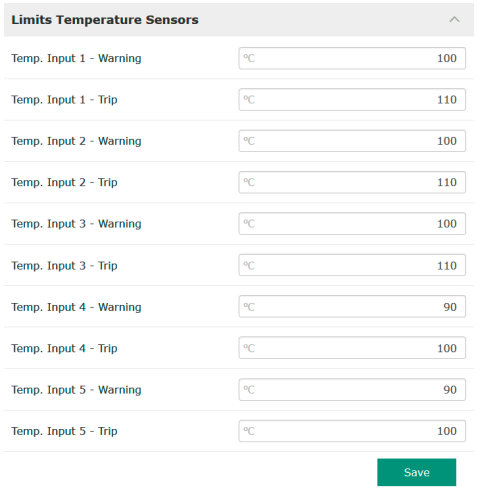
Combination of up to four pumps in one system.

→ Enable
Activate pump in the system.
Factory setting: off

→ Master IP
Fixed IP address via which the system incl. the system home page can be reached. The IP address must be specified by the operator! Associating the pumps with the system is defined by this static IP address. Enter the Master IP for all pumps of a system. The master function is automatically assigned to a pump in the system (redundant master pump).

NOTICE! All IP addresses (slave and master) in the same subnet!

6.5.5.6 Limits Temperature Sensors



Overview of potential temperature sensors and limit value input.

Temperature sensor overview

No.	Description	Display
Temp. input 1	Winding temperature 1	Winding Top/Bot 1
Temp. input 2	Winding temperature 2	Winding 2
Temp. input 3	Winding temperature 3	Winding 3
Temp. input 4	Top motor bearing temperature	Bearing Top 4
Temp. input 5	Bottom motor bearing temperature	Bearing Bot 5

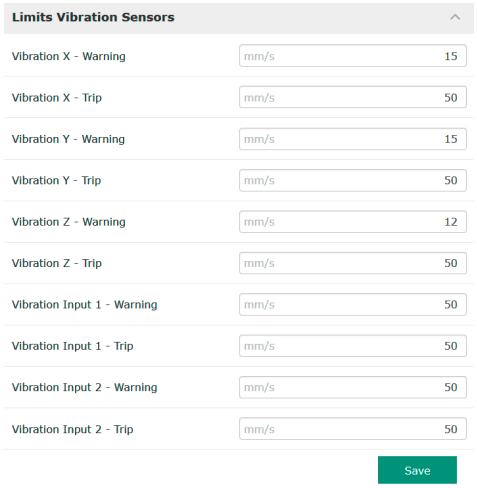
Limit value input

→ Temp. Input 1 – Warning
Limit value for a warning in °C.
Factory setting: default factory setting
Input: 0 °C to default factory setting

→ Temp. Input 1 – Trip
Limit value for pump shutdown in °C.
Factory setting: default factory setting
Input: 0 °C up to factory specification. The value must be 2 °C higher than the warning limit value.

Key
"1" is a placeholder for input numbers 1 to 5.

6.5.5.7 Limits Vibration Sensors



Overview of potential vibration sensors and inputting limit values.

Vibration sensor overview

No.	Description	Display
Vibration X, Y, Z	Vibration sensor in DDI	VibX, VibY, VibZ
Vibration input 1/input 2	Input for external vibration sensor	VibHut, VibTop, VibBot

Limit value input

→ Vibration X – Warning
Limit value for a warning in mm/s.
Factory setting: default factory setting
Input: 0 % to default factory setting

→ Vibration X – Trip
Limit value for pump shutdown in mm/s.
Factory setting: default factory setting
Input: 0 % to default factory setting. The value must be 2 % higher than the limit value for the warning.

Key
"X" represents a placeholder for the input number X, Y, Z, 1 or 2.

6.5.6 Frequency Converter

Frequency converter basic settings:

→ IP / Type Select
Settings for communication with the frequency converter

→ Auto Setup
Automatic frequency converter configuration

→ Ramp Settings
Timing for starting ramp and brake ramp

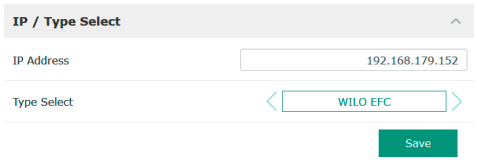
→ Digital Inputs
Digital input configuration.

→ Analog Inputs
Analogue input configuration.

→ Relay Outputs
Relay output configuration.

→ Analog Outputs
Analogue output configuration.

6.5.6.1 IP / Type Select

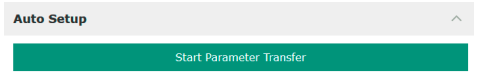


Basic setting for communication between pump and frequency converter.

→ IP Address
IP address of the frequency converter.

→ Type Select
Select appropriate frequency converter.
Factory setting: Wilo-EFC

6.5.6.2 Auto Setup



Thanks to automatic parameter configuration the Digital Data Interface configures the basic settings of the connected frequency converter. Note the following:

→ Automatic parameter configuration overwrites all settings within the frequency converter!

→ Automatic parameter configuration configures digital input assignment!

→ Run automatic motor adaptation in the frequency converter after having completed automatic parameter configuration!

Run automatic parameter configuration.

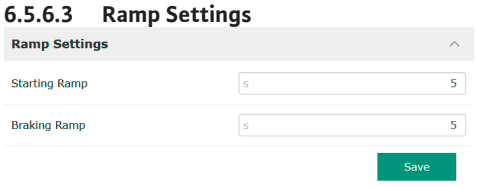
✓ IP address of the frequency converter has been entered.

✓ Correct frequency converter has been selected.

✓ Frequency converter is set to "Stop"

1. Click "Start Parameter Transfer"
2. "Auto Setup" starts.
3. The following message appears once the transfer has finished: "Succesfully Completed".

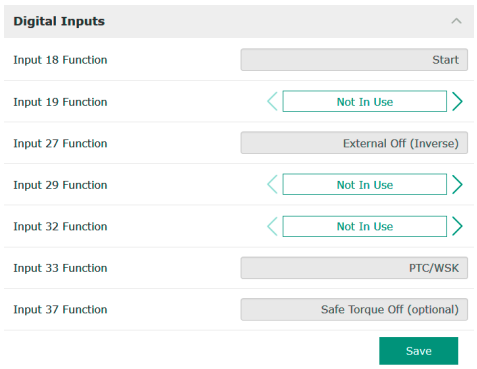
6.5.6.3 Ramp Settings



→ Starting Ramp
Timing in seconds.
Factory setting: 5 s
Input: 1 to 20 s

→ Braking Ramp
Timing in seconds.
Factory setting: 5 s
Input: 1 to 20 s

6.5.6.4 Digital Inputs



Assigning the available functions to the relevant inputs. Designation of the input terminals matches the designation at frequency converter Wilo-EFC.

The following inputs are permanently preassigned by automatic parameter configuration:

→ Input 18 Function
Function: Start
Description: Input/output signal from primary control.

→ Input 27 Function
Function: External Off (Inverse)
Description: Remote deactivation using a separate switch. **NOTICE! The input directly switches over the frequency converter!**

→ Input 33 Function
Function: PTC/WSK
Description: Connection of hardware temperature sensor in the motor winding

→ Input 37 Function
Function: Safe Torque Off (STO) – safe deactivation
Description: hardware pump deactivation by frequency converter, regardless of pump control. Automatic reactivation is not possible (reactivation lock).
DANGER! Connect temperature sensor and dry-running protection hardware here if the pump is used within potentially explosive atmospheres! For this purpose, install the optionally available "MCB 112" expansion card in the frequency converter.

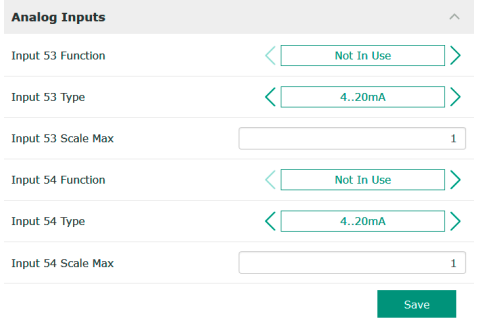
Available functions can be freely assigned for the following inputs:

→ Input 19 Function
→ Input 29 Function
→ Input 32 Function
Factory setting: Not In Use
Input:

- High Water
  Signal for overflow level.
- Dry Run
  Signal for dry-running protection.
- Leakage Warn
  Signal for external sealing chamber monitoring. A warning message is output in the event of a fault.
- Leakage Alarm
  Signal for external sealing chamber monitoring. The pump is shut down in the event of a fault. Modify the alarm type in the configuration to define the downstream response.
- Reset
  External signal to reset error messages.
- High Clogg Limit
  Activating higher tolerance ("Power Limit - High") for clogging detection.

NOTICE! The assignment of the inputs must match the hardware allocation on the frequency converter!

6.5.6.5 Analog Inputs



Assignment of the available functions and input types to the relevant inputs. Designation of the input terminals matches the designation at frequency converter Wilo-EFC.

The following inputs can be configured:

→ Input 53 Function
→ Input 54 Function

NOTICE! The assignment must match the hardware assignment at the frequency converter!

→ Input 53 Function/Input 54 Function
Factory setting: Not In Use
Input:

- External Control Value
  Setpoint specification to control the pump speed as part of an analogue signal from primary control.

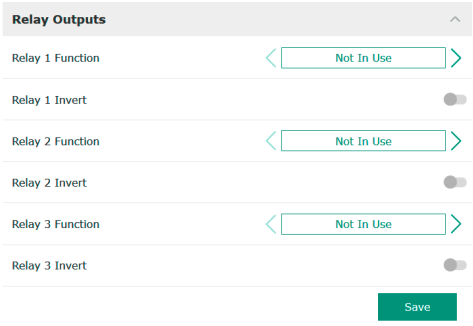
- Level
  Recording the current fill level to record data. Basis for the "Increasing" and "Dropping" level functions at the digital output.
- Pressure
  Recording the current system pressure to record data.
- Flow
  Recording the current flow rate to record data.

→ Input 53 Type/Input 54 Type
Also adjust the signal type (voltage (U) or current (I)) in the hardware at the frequency converter. Observe the frequency converter installation and operating instructions!
Factory setting: 4...20 mA
Input:

- 0...20 mA
- 4...20 mA
- 0...10 V

→ Input 53 Scale Max/Input 54 Scale Max
Factory setting: 1
Input: Maximum value as real numerical value with unit. The units for the control values are:
- Level = m
- Pressure = bar
- Flow = l/s
Separator for decimal places: Point

6.5.6.6 Relay Outputs



Assignment of the available functions to the relevant outputs. Designation of the output terminals matches the designation at frequency converter Wilo-EFC.

The following outputs can be configured:
→ Relay 1 Function
→ Relay 2 Function

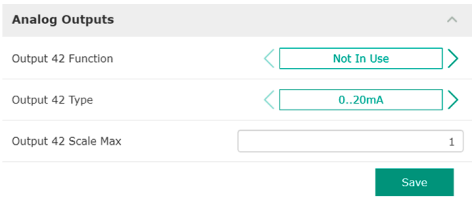
NOTICE! The assignment must match the hardware assignment at the frequency converter!

→ Relay 1 Function/Relay 2 Function
Factory setting: Not In Use
Input:

- Run
  Individual run signal of the pump
- Rising Level
  Message for increasing level.
- Falling Level
  Message for dropping level.
- Error
  Individual fault signal of the pump: Alarm.
- Warning
  Individual fault signal of the pump: Warning.
- Cleaning
  Message when the cleaning sequence of the pump is started.

→ Relay 1 Invert/Relay 2 Invert
Output functionality: normal or inverted.
Factory setting: Off (normal)

6.5.6.7 Analog Outputs



Assignment of the available functions to the relevant outputs. Designation of the output terminals matches the designation at frequency converter Wilo-EFC.

The following outputs can be configured:
→ Output 42 Function

NOTICE! The assignment must match the hardware assignment at the frequency converter!

→ Output 42 Function

Factory setting: Not In Use
Input:

- Frequency
  Current actual frequency output.
- Level
  Current fill level output. **NOTICE! For output, connect a corresponding signal transmitter to an input!**
- Pressure
  Current operating pressure output. **NOTICE! For output, connect a corresponding signal transmitter to an input!**
- Flow
  Display of the current flow quantity. **NOTICE! For output, connect a corresponding signal transmitter to an input!**

→ Output 42 Type
Factory setting: 4...20 mA
Input:

- 0...20 mA
- 4...20 mA

→ Output 42 Scale Max
Factory setting: 1
Input: Maximum value as real numerical value without unit or delimiters for decimal places: Point

6.5.7 I/O Extension

Basic I/O module settings (input/output extensions):

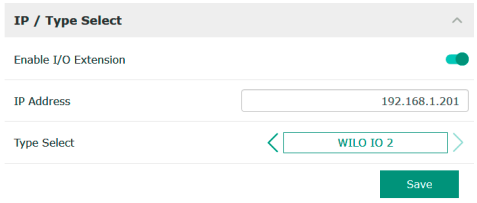
→ IP / Type Select
Settings for communication with the I/O module

→ Digital Inputs
Digital input configuration.

→ Analog Inputs
Configuration of the analogue inputs (only available in Wilo I/O 2).

→ Relay Outputs
Configuration of the relay outputs. The number of outputs depends on the selected I/O module.

6.5.7.1 IP / Type Select



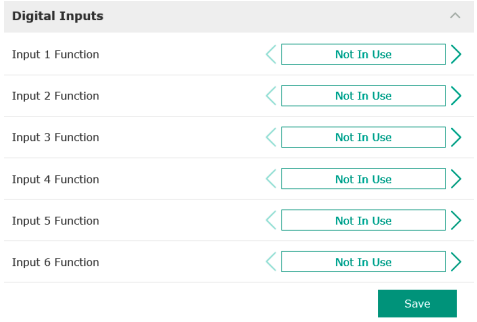
Basic setting for the communication between pump and I/O module.

→ Enable I/O Extension
Switch function on/off.
Factory setting: Off

→ IP Address
IP address of the I/O module.

→ Type Select
Select I/O module.
Factory setting: Wilo IO 1
Input: Wilo IO 1 (ET-7060), Wilo IO 2 (ET-7002)

6.5.7.2 Digital Inputs



Assigning the available functions to the relevant inputs. The name of the input terminals matches the name on the I/O module. Available functions can be freely assigned for the following inputs:

→ Input 1 Function
→ Input 2 Function
→ Input 3 Function
→ Input 4 Function
→ Input 5 Function
→ Input 6 Function
Factory setting: Not In Use
Input:
NOTICE! In LPI system mode, the functions on the I/O module are the same as on the frequency converter. The following description addresses the LSI system mode.

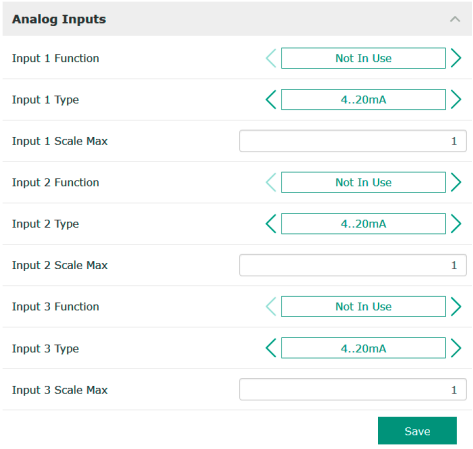
- High Water

Signal for overflow level.

- Dry Run
  Signal for dry-running protection.
- Reset
  External signal to reset error messages.
- System Off
  External signal to switch off the system.
- Trigger Start Level
  Start drainage pumping sequence. Pump chamber is drained to the switch-off level.
- Alternative Start Level
  Activate alternative switch-on level.

NOTICE! The assignment must match the hardware assignment at the I/O module!

6.5.7.3 Analog Inputs



Assigning the available functions to the relevant inputs. The name of the input terminals matches the name on the I/O module. Available functions can be freely assigned for the following inputs:

→ Input 1 Function
→ Input 2 Function
→ Input 3 Function

Settings

→ Input 1 Function ... Input 3 Function
Factory setting: Not In Use
Input:
NOTICE! In LPI system mode, the functions on the I/O module are the same as on the frequency converter. The following description addresses the LSI system mode.

- Level
  Setpoint specification for the control modes in LSI system mode.
  NOTICE! Requirements for the LSI system mode! Assign this function to an input.
- Pressure
  Recording the current system pressure to record data.
  NOTICE! Can be used as control value for the PID controller!
- Flow
  Recording the current flow rate to record data.
  NOTICE! Can be used as control value for the PID and HE controller!
- External Control Value
  Setpoint specification from a higher-level control system to the control of the pumping station as an analogue signal. **NOTICE! In LSI system mode, the pumping station operates autonomously from a higher-level control system. If the setpoint specification must be made by a higher-level control system, please contact customer service!**

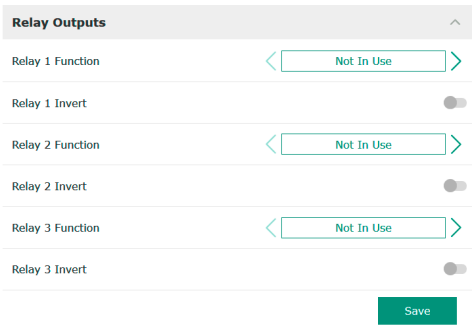
→ Input 1 Type ... Input 3 Type
Selected measurement range is transferred to the I/O module. **NOTICE! Set the signal type (current or voltage) in the hardware. Observe the manufacturer's instructions!**
Factory setting: 4 ... 20 mA
Input:

- 0 ... 20 mA
- 4 ... 20 mA
- 0 ... 10 V

→ Input 1 Scale Max ... Input 3 Scale Max
Factory setting: 1
Input: Maximum value as real numerical value with unit. The units for the control values are:
- Level = m
- Pressure = bar
- Flow = l/s

Separator for decimal places: Point

6.5.7.4 Relay Outputs



Assignment of the available functions to the relevant outputs. The name of the output terminals matches the name on the I/O module. Available functions can be freely assigned for the following outputs:

- → Relay 1 Function
- → Relay 2 Function
- → Relay 3 Function
- → Relay 4 Function
- → Relay 5 Function
- → Relay 6 Function

NOTICE! The Wilo IO 2 has only three relay outputs!

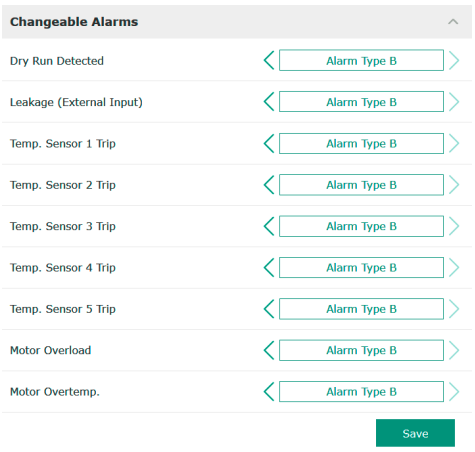
Settings

- → Relay 1 Function ... Relay 6 Function
  Factory setting: Not In Use
  Input:
  NOTICE! In LPI system mode, the functions on the I/O module are the same as on the frequency converter. The following description addresses the LSI system mode.
  - Run
    Collective run signal
  - Rising Level
    Message for increasing level.
  - Falling Level
    Message for dropping level.
  - System Warning
    Collective fault signal: Warning.
  - System Error
    Collective fault signal: Error.
  - Cleaning
    Message when a cleaning sequence of a pump is active.
- → Relay 1 Function ... Relay 6 Function
  Output operation: normal or inverting.
  Factory setting: off (normal)

6.5.8 Alarm / Warning Types

Two levels of priority can be assigned to certain alarm signals and warning messages.

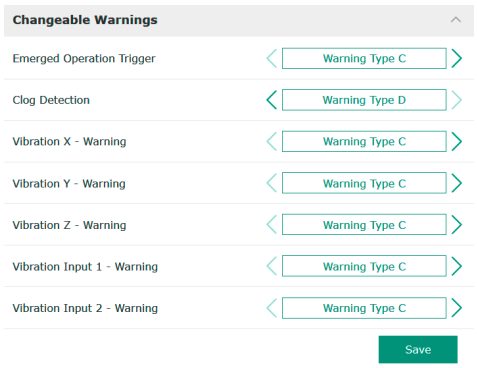
6.5.8.1 Changeable Alarms



The following priority settings can be assigned for the illustrated alarm signals:

- → Alert Type A: The pump is shut down in the event of a fault. The alarm signal **must be reset manually**:
  - Reset Error on the start screen
  - "Reset" function at a digital input of the frequency converter or I/O module
  - Corresponding signal via fieldbus
- → Alert Type B: The pump is shut down in the event of a fault. The alarm signal is automatically reset once the fault has been eliminated.

6.5.8.2 Changeable Warnings



The following priority settings can be assigned to the warning messages shown:

→ Warning Type C: These warnings can switch a relay output on the frequency converter or of the I/O module.

→ Warning Type D: These warnings are only displayed and logged.

6.6 Function modules

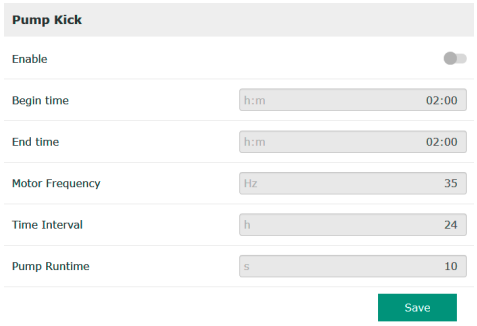
Functional overview depending on the system mode.

Function modules	System mode			
	DDI	LPI	LSI Master	LSI Slave
Pump Kick	–	•	–	•
Emerged Operation	–	•	–	•
Operating Mode (Pump)	–	•	–	•
Clog Detection	–	•	–	•
Anti-Clogging Sequence	–	•	–	•
Operating Mode (System)	–	–	•	–
System Limits	–	–	•	–
Level Controller	–	–	•	–
PID Controller	–	–	•	–
High Efficiency(HE) Controller	–	–	•	–

Key

– = Not available, • = Available

6.6.1 Pump Kick



Periodic pump operation is possible to prevent prolonged pump standstill.

→ Enable
Switch function on and off.
Factory setting: Off

→ End time and Begin time
Periodic pump operation is not enforced outside this period.
Factory setting: 00:00
Input: hh:mm

→ Motor Frequency
Operating frequency for periodic pump operation.
Factory setting: 35 Hz
Input: 25 Hz to max. frequency according to the rating plate

→ Time Interval
Permissible standstill time between two periodic pump operation cycles.
Factory setting: 24 h
Input: 0 to 99 h.

→ Pump Runtime
Running time of the pump during periodic pump operation.
Factory setting: 10 s
Input: 0 to 30 s

6.6.2 Emerged Operation

The motor winding is equipped with temperature monitoring. This monitoring enables the pump to carry out non-immersed operation without reaching the max. winding temperature. The temperature is measured using Pt100 sensors.

→ Enable
Switch function on and off.
Factory setting: Off

→ Restart Hysteresis
Temperature difference to the temperature limit beyond which the pump is switched on again. **NOTICE! Required for "Two-point controller" operating mode only!**
Factory setting: 5 °C
Input: 1 bis 20 °C

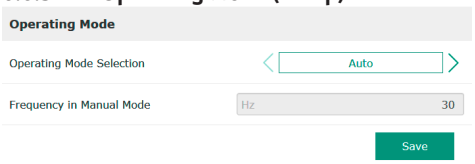
→ Temperature Limit
The temperature limiter is activated once the set temperature limit has been reached.
Factory setting: Ex works warning threshold for winding temperature
Input: 40 °C to ex works shutdown temperature of the winding

→ Operating Mode
Factory setting: On/Off
Input: On/Off (two-point controller) or PID

– On/Off (two-point controller)
Pump is switched off once it reaches the set temperature limit. The pump switches back on as soon as the winding temperature has once again dropped by the set hysteresis value.

– PID
In order to prevent the pump being shut down, the motor speed is controlled as a function of the winding temperature. The motor speed is reduced as the winding temperature increases. This enables a longer pump operation.

6.6.3 Operating Mode (Pump)



→ Operating Mode Selection
Specify in which operating mode the pump is being used.
Factory setting: Off
Input: Auto, Manual or Off

– Off
Pump off.

– Manual
Switch on pump by hand. The pump runs until the "Off" button has been clicked or the switch-off level has been reached.
NOTICE! Enter a frequency for the duty point for manual operation! (See menu: "Function Modules ➔ Operating Mode ➔ Frequency in Manual Mode")
NOTICE! "LSI" system mode: manual operation is only possible if the master operating mode is "off"!

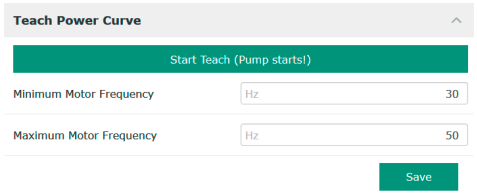
– Auto
Automatic operation of the pump.
"LPI" system mode: Setpoint specification using primary control.
"LSI" system mode: Setpoint specification by the system master.

→ Frequency in Manual Mode
Frequency set point for the duty point in **manual operation**.
Factory setting: 0 Hz
Input: 25 Hz to max. rated frequency according to the rating plate

6.6.4 Clog Detection

The pump is equipped with an algorithm that can detect clogging in the hydraulics. The basis for the algorithm is a deviation of the rated power from the reference curve. The reference curve is calibrated during a **“learning phase”**. The conditions for the clogging detection are saved in the **“Settings”**.

6.6.4.1 Clog Detection – Teach Power Curve



A reference curve must be calibrated to activate clogging detection.

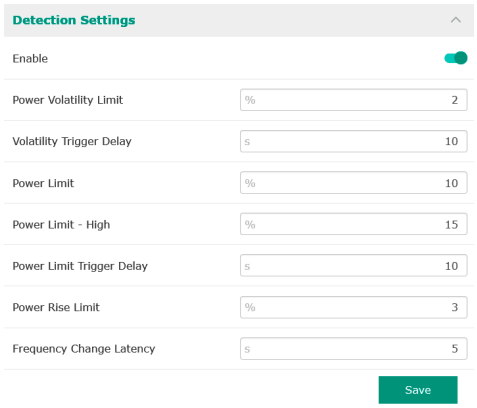
→ Minimum Motor Frequency
Minimum frequency from which clogging detection activates.
Factory setting: 30 Hz
Input: 1 Hz to max. rated frequency according to the rating plate

→ Maximum Motor Frequency
Maximum frequency up to which clogging detection activates.
Factory setting: Rated frequency according to the rating plate
Input: 1 Hz to max. rated frequency according to the rating plate

Once all values have been set, click the "Start Teach (Pump starts!)" button to start the teach-in phase. On-screen feedback confirms completion of the teach-in phase.

NOTICE! No clogging detection during teach-in phase!

6.6.4.2 Clog Detection – Detection Settings



Defining the framework conditions for clogging detection. **NOTICE! Save a reference characteristic to be able to activate clogging detection!** (➔ "Teach Power Curve")

→ Enable
Switch function on and off.
Factory setting: Off

→ Power Volatility Limit
Permissible variation from the averaged power consumption in %.
Factory setting: 2 %
Input: 0 to 100 %

→ Volatility Trigger Delay
A cleaning process is started if the permissible variation from the averaged power consumption over the set duration is greater than the permissible variation.
Factory setting: 10 s
Input: 0 to 60 s

→ Power Limit
Permissible variation from the reference curve in %.
Factory setting: 10 %
Input: 0 to 100 %

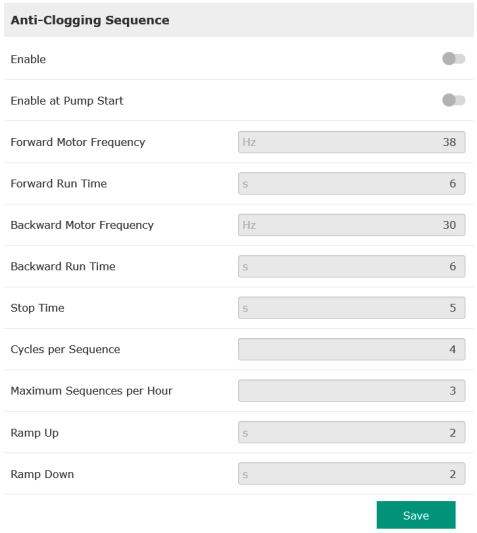
→ Power Limit Trigger Delay
A cleaning process is started once the permissible output deviation in relation to the reference characteristic is greater than the permissible deviation over the set duration.
Factory setting: 10 s
Input: 0 to 60 s

→ Power Limit – High
Permissible variation from the reference characteristic in %, if digital input "High Clog Limit" is active.
Factory setting: 15 %
Input: 0 to 100 %

→ Power Rise Limit
Comparison of the average power consumption during normal operation and during clogging detection. The average power consumption is recorded during normal operation and during clogging detection. The length of the recording is set ex works. Both values are compared with each other. A cleaning process is started if the value during clogging detection is higher than the value in normal operation by the set factor.
Factory setting: 3 %
Input: 0 to 100 %

→ Frequency Change Latency
Length of time after a change in frequency until new measuring data is saved for calculations.
Factory setting: 5 s
Input: 0 to 60 s

6.6.5 Anti-Clogging Sequence



If required the pump can start a cleaning sequence if clogging detection has been activated. In order to release and pump out the blockage, the pump runs alternately forwards and in reverse several times.

→ Enable
Switch function on and off.
Factory setting: Off

→ Enable at Pump Start
A cleaning sequence is started prior to each pumping process.
Factory setting: Off

→ Forward Motor Frequency
Frequency specification for forward operation during the cleaning sequence.
Factory setting: 38 Hz
Input: 0 to 60 Hz

→ Forward Run Time
Running time for forward operation.
Factory setting: 6 s
Input: 0 to 30 s

→ Backward Motor Frequency
Frequency specification for reverse operation during the cleaning sequence.
Factory setting: 30 Hz
Input: 0 to 60 Hz

→ Backward Run Time
Running time for reverse operation.
Factory setting: 6 s
Input: 0 to 30 s

→ Stop Time
Standstill time between forward and reverse operation.
Factory setting: 5 s
Input: 0 to 10 s

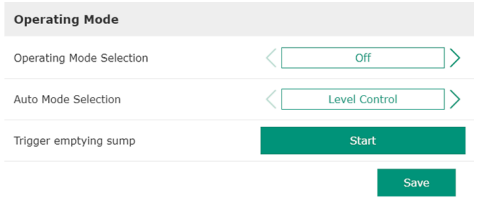
→ Cycles per Sequence
Number of forward and reverse operations during a cleaning sequence.
Factory setting: 4
Input: 1 to 10

→ Maximum Sequences per Hour
Max. number of cleaning sequences in one hour.
Factory setting: 3
Input: 1 to 10

→ Ramp Up
Start-up time of the motor from 0 Hz to the set frequency.
Factory setting: 2 s
Input: 0 to 10 s

→ Ramp Down
Switch-off time of the motor from the set frequency to 0 Hz.
Factory setting: 2 s
Input: 0 to 10 s

6.6.6 Operating Mode (System)



Specify basic settings for the system.

→ Operating Mode Selection
Specify in which operating mode the system is being operated.
Factory setting: Off
Input: Auto, Off

- Off
  System off. Manual mode of individual pumps possible via the home page of the relevant pump.
- Auto
  Automatic operation of the system via the set controller under "Auto Mode Selection".

→ Auto Mode Selection

Specify which controller controls the system.
Factory setting: Level Control
Input: Level Control, PID, HE-Controller

→ Trigger emptying sump
Start manual pump process. The max. specified pumps run up to the specified switch-off/stop level of the set level detection (see System Limits ➜ Pump Limits and Changer).

6.6.7 System Limits

Specify the permissible application limits of the system:

→ Levels
Specify the levels for high water and dry-running protection.

→ Dry Run Sensor Selection
Determine the signal source for dry running.

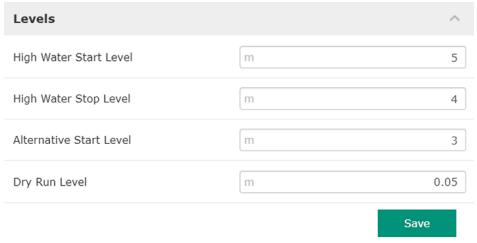
→ Pump Limits and Changer
Settings for regular pump cycling.

→ Min/Max Frequency
Specify the minimum and maximum operating frequency.

→ Start Frequency
Specify an increased operating frequency when starting the pump.

→ Alternative Stop Level
Additional shut-down level for completely draining the pump chamber and aeration of the level probe.

6.6.7.1 Levels



Define different filling levels for switching the pumps on and off. **NOTICE! Connect a level sensor for detecting the filling levels!**

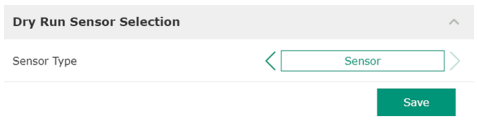
→ High Water Start Level
If the set level is reached, start the max. specified pumps (see System Limits ➜ Pump Limits and Changer). An entry is made in the Data Logger.
Factory setting: 100 m
Input: 0.05 to 100 m

→ High Water Stop Level
If the set level is reached, all additionally started pumps are switched off. Only those pumps remain in operation that are required according to the control system. An entry is made in the Data Logger.
Factory setting: 100 m
Input: 0.05 to 100 m

→ Alternative Start Level
Additional switch-on level for draining the pump chamber earlier. This earlier switch-on level increases the standby chamber volume for special events, e.g. heavy rain. To activate the additional switch-on level, assign a digital input on the I/O module with the function "Alternative Start Level". If the set level is reached, start the max. specified pumps (see System Limits ➜ Pump Limits and Changer).
Factory setting: 100 m
Input: 0.05 to 100 m

→ Dry Run Level
All pumps are switched off when the set level has been reached. An entry is made in the Data Logger.
Factory setting: 0.05 m
Input: 0.05 to 100 m

6.6.7.2 Dry Run Sensor Selection

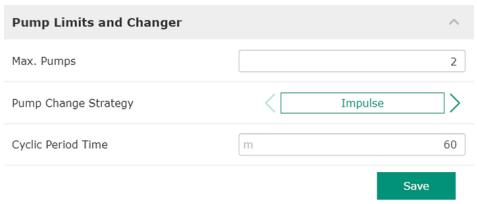


Specify the sensor for the dry run.

→ Sensor Type
Factory setting: Sensor
Input: Sensor, Dry Run Input

- Sensor
  The dry run level is determined via the level sensor.
- Dry Run Input
  The signal for the dry run level is transmitted via a digital input.

6.6.7.3 Pump Limits and Changer



The base-load pump is regularly switched in order to prevent irregular running times of the individual pumps.

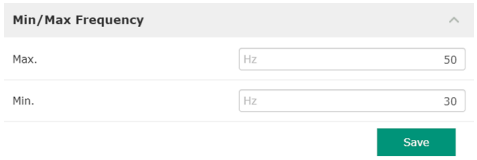
→ Max. Pumps
Max. number of pumps in the system that may be operated simultaneously.
Factory setting: 2
Input: 1 to 4

→ Pump Change Strategy
Basic control for pump cycling.
Factory setting: Impulse
Input: Impulse, Cyclic

- Impulse
  Pump cycling takes place after all pumps have been stopped.
- Cyclic
  Pump cycling takes place after the specified time under "Cyclic Period Time".

→ Cyclic Period Time
If the "Cyclic" change mode is set, enter here the duration after which a pump cycling takes place.
Factory setting: 60 min
Input: 1 to 1140 min

6.6.7.4 Min/Max Frequency



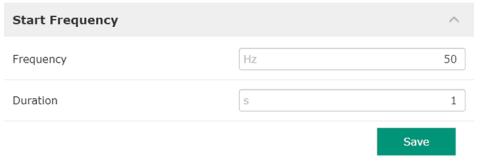
Specify the minimum and maximum operating frequency of the pumps in the system:

→ Max.
Maximum operating frequency of the pumps in the system.
Factory setting: maximum frequency according to rating plate
Input: from **minimum** to **maximum** frequency **according to rating plate**

→ Min.
Minimum operating frequency of the pumps in the system.
Factory setting: minimum frequency according to rating plate
Input: from **minimum** to **maximum** frequency **according to rating plate**

NOTICE! The input is limited by the application limit of the pump set by the factory!

6.6.7.5 Start Frequency



Specify an increased operating frequency when starting the pump.

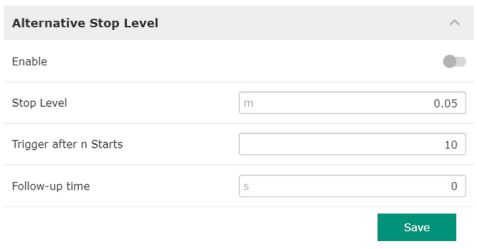
→ Frequency
Operating frequency at pump start.
Factory setting: maximum frequency according to rating plate
Input: from **minimum** to **maximum** frequency **according to rating plate**

NOTICE! This function is only active if the setpoint frequency of the controller is lower than the increased start frequency.

NOTICE! If the set value is equal to the minimum frequency, the function is deactivated.

→ Duration
During the specified time, the pumps run at the increased operating frequency. The frequency is then individually controlled depending on the control mode.
Factory setting: 1 s
Input: 1 to 30 s

6.6.7.6 Alternative Stop Level



Additional switch-off level to lower the fill level in the pump chamber and to aerate the level sensor. The additional shut-down level is activated after a specified number of pump cycles has been reached.

NOTICE! Set switch-off level above the level value for dry-running protection!

→ Enable
Switch function on and off.
Factory setting: Off

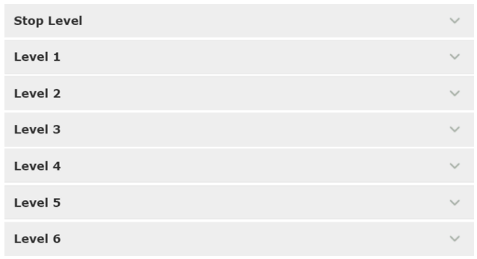
→ Stop Level
Set the desired fill level.
Factory setting: 0.05 m
Input: 0.05 to 100 m

→ Trigger after n Starts

Number of pump cycles until the additional switch-off level becomes active.
Factory setting: 10
Input: 2 to 100

→ Follow-up time
Follow-up time of the pumps until deactivation.
Factory setting: 0 s
Input: 0 to 300 s

6.6.8 Level Controller

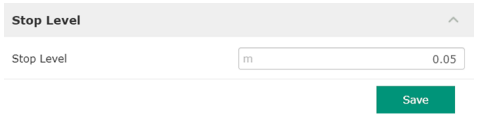


Specify individual switching levels:

→ Stop level
Shut-down level for all pumps.

→ Levels 1 to 6
Specify up to six switching levels.

6.6.8.1 Stop Level



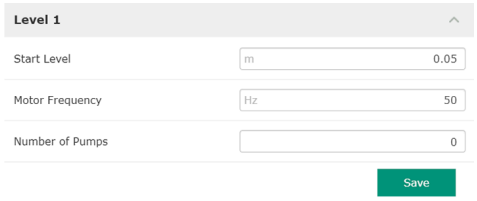
Shut-down level for all pumps.

NOTICE! Set switch-off level above the level value for dry-running protection!

NOTICE! If the "alternative switch-off level" is used, set this level value over the level value for the "alternative switch-off level"!

→ Stop Level
Factory setting: 0.05 m
Input: 0.05 to 100 m

6.6.8.2 Level 1 ... 6



Specify up to six different switching levels for controlling the pumps. **NOTICE! It is not necessary to define the switching levels one after the other!**

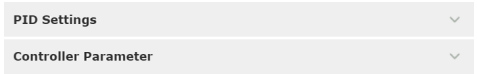
→ Start Level
Start level for the pump sequence.
Factory setting: 0.05 m
Input: 0.05 to 100 m

→ Motor Frequency
Specification of the operating frequency for the pump sequence.
Factory setting: Minimum frequency of the pump
Input: Minimum frequency of the pump up to max. frequency of the pump according to the rating plate

→ Number of Pumps
Number of pumps that are started for the pump sequence.
Factory setting: 0
Input: 0 to 4

NOTICE! The value 0 deactivates the level specification!

6.6.9 PID Controller

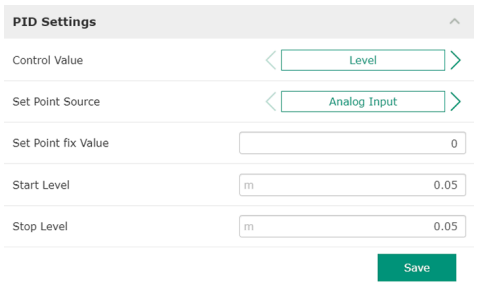


Settings for pump control:

→ PID Settings
Basic settings for the PID control.

→ Controller Parameter
Basic settings for the PID controller.

6.6.9.1 PID Settings



Basic settings for the PID control.

→ Control Value
Specifying the control parameter.
Factory setting: Level
Input: Level, Pressure, Flow

→ Set Point Source
Setpoint specification for the control.
Factory setting: Analog Input
Input: Analog Input, Bus Input, Fix

– Analog Input
The values of the lower-level control are transmitted in analogue form to the I/O module 2 (ET-7002). **NOTICE! Configure the analogue input with the "setpoint" value!**

– Bus Input
The values of the primary control are transmitted to the pump via the Ethernet network. ModBus TCP or OPC UA are used as communication protocols.

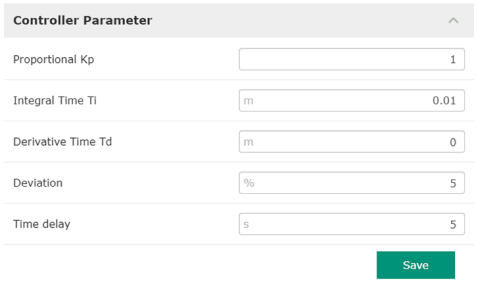
– Fix
Fixed specification for the setpoint.

→ Set Point fix Value
If the "Fix" value is selected in the setting "Set Point Source", enter the corresponding setpoint here.
Factory setting: 0
Input: free input of the desired setpoint. The units for the control values are:
- Level = m
- Pressure = bar
- Flow = l/s

→ Start Level
When the set level is reached, at least one pump starts. The actual number of pumps started depends on the deviation from the target value. The maximum number of pumps to be started is set in the menu "System Limits" (see System Limits ➔ Pump Limits and Changer).
Factory setting: 0.05 m
Input: 0.05 to 100 m

→ Stop Level
All pumps are switched off when the set level has been reached.
Factory setting: 0.05 m
Input: 0.05 to 100 m

6.6.9.2 Controller Parameter



Basic settings for the PID controller.

→ Proportional Kp
Gain factor
Factory setting: 1
Input: -1000 to 1000

NOTICE! For fill level control, set the proportional value Kp negative (-)!

→ Integral Time Ti
Reset/integral time
Factory setting: 0.01 min
Input: 0 to 10000 min

→ Derivative Time Td
Differential/retention time
Factory setting: 0 min
Input: 0 to 1000 min

NOTICE! The differential component Td is generally not used in wastewater applications. Preferably set value to "0"!

→ Deviation
Permissible deviation between actual value and setpoint.
Factory setting: 5 %
Input: 0 to 100 %

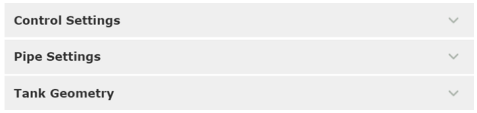
Control conditions

– Setpoint deviation is outside the defined limit.

– Output frequency reaches the **maximum** frequency.
If both conditions apply for a defined duration, a pump is **switched on**.
– Setpoint deviation is outside the defined limit.
– Output frequency reaches the **minimum** frequency.
If both conditions apply for a defined duration, a pump is **switched off**.
For the values of maximum and minimum frequency see System Limits ➔ Min/Max Frequency.

→ Time delay
Delay/follow-up time
Factory setting: 5 s
Input: 0 to 300 s

6.6.10 High Efficiency(HE) Controller



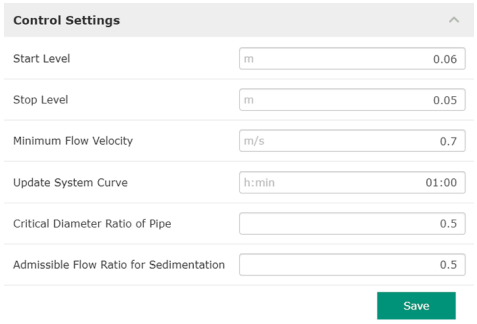
Settings for pump control:

→ Control Settings
Basic settings for the HE controller.

→ Pipe Settings
Piping details.

→ Tank Geometry
Chamber geometry details.

6.6.10.1 Control Settings



Basic settings for the pump control.

→ Start Level
A pump starts when the set level has been reached.
Factory setting: 0.05 m
Input: 0.05 to 100 m

→ Stop Level
The active pump is switched off when the set level has been reached.
Factory setting: 0.05 m
Input: 0 to 100 m

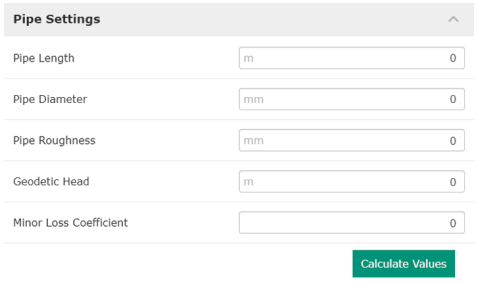
→ Minimum Flow Velocity
Specifying the minimum flow velocity in the piping.
Factory setting: 0.7 m/s
Input: 0 to 100 m/s

→ Update System Curve
Start time for measuring the system curve.
Factory setting: 00:00 h
Input: 00:00 to 23:59 hrs

→ Critical Diameter Ratio of Pipe
Permissible ratio of theoretical to actual piping cross-section. If the permissible ratio is not reached, sedimentation of the piping is detected. The piping is flushed at the rated frequency.
Factory setting: 0.5
Input: 0 to 1

→ Admissible Flow Ratio for Sedimentation
Permissible ratio of the flow rates during initial commissioning and before and during flushing. If the permissible ratio is exceeded, flushing is stopped.
Factory setting: 0.5
Input: 0 to 1

6.6.10.2 Pipe Settings



Piping details.

→ Pipe Length
Total length of the piping to the next pumping station.
Factory setting: 0 m
Input: 0 to 100,000 m

→ Pipe Diameter
Factory setting: 0 mm
Input: 0 to 10,000 mm

→ Pipe Roughness

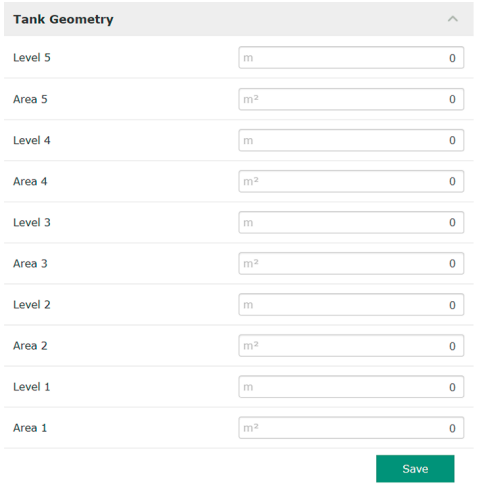
Indication of the absolute pipe roughness.
Factory setting: 0 mm
Input: 0 to 100 mm

→ Geodetic Head
Height difference between the water surface in the pump and the highest point in the connected pressure pipe.
Factory setting: 0 m
Input: 0 to 100 m

→ Minor Loss Coefficient
Dimensional ratio for calculating the pressure loss in the pressure pipe.
Factory setting: 0
Input: 0 to 100

To accept the specified values, click "Calculate Values".

6.6.10.3 Tank Geometry



Chamber geometry details. The system uses up to five parameters to calculate the geometry of the chamber. **NOTICE! The parameters do not have to be specified in sequence!**

→ Level 1 ... 5
Factory setting: 0 m
Input: 0 to 100 m

→ Area 1 ... 5
Factory setting: 0 m²
Input: 0 to 100 m²
NOTICE! The value 0 deactivates the respective specification!
NOTICE! In order for the pump to function properly, at least two surfaces must be specified: cylindrical chamber geometry, minimum and maximum flow level!

7 Extras

7.1 Backup/Restore

The following functions are available:

→ Backup/Restore
Possibility to save the current configuration or restore the configuration from a file.

→ Restore Configuration Files
Reset Digital Data Interface to the condition upon delivery.

Save configuration

1. Click "Save" next to "Save settings to local file".
2. Select the storage location in the selection window.
3. Click on "Save" in the selection window.

► Configuration saved.

Restore configuration settings

1. Click "Browse" next to "Load backup from local file".
2. Select the storage location of the desired configuration in the selection window.
3. Select file.
4. Click on "Open" in the selection window.

► The configuration is loaded.

► When the configuration is loaded, the message "Successfully loaded backup file!" is shown.

Restore to condition upon delivery

1. Click "Restore".
   ⇒ Security prompt appears: All existing configurations will be lost and default values will be loaded.
2. Confirm the safety query with "Ok".

- ► The condition upon delivery is loaded.
- ► If the condition upon delivery is loaded, the following message is displayed "Configuration files are restored successfully".

7.2 Software update

The following functions are available:
→ Install new software bundle
Install new firmware for the Digital Data Interface.
→ Update device's license
Install the Digital Data Interface upgrade for "LPI" or "LSI" operating modes.

Install new software bundle

Save a backup of the current configuration before updating the firmware! It is also recommended that productive systems undergo an internal test prior to application in the customer environment. Despite comprehensive quality assurance measures, this WILO SE cannot exclude all risks.

NOTICE! If the pump is operated in system mode "LSI", switch off the pump in the system before updating the firmware!

1. Open the home page of the slave pump.
2. Click "Settings".
3. Click "Digital Data Interface".
4. Click "LSI Mode System Settings".
5. Deactivate LSI mode.
6. If the firmware has been updated, reactivate LSI mode.

✓ LSI mode: LSI mode for the pump deactivated.
✓ Pump switched off.

1. Click "Browse" next to "Pick update bundle".
2. Select the location of the file in the selection window.
3. Select file.
4. Click on "Open" in the selection window.
5. Click "Submit".
   ⇒ The data is transferred to the Digital Data Interface. Once the file has been transferred, detailed information about the new version is displayed in the right-hand window.
6. Initiate update: Click "Apply".

- ► New firmware is loaded.
- ► Once the firmware is loaded, the message "Bundle uploaded successfully" is displayed.

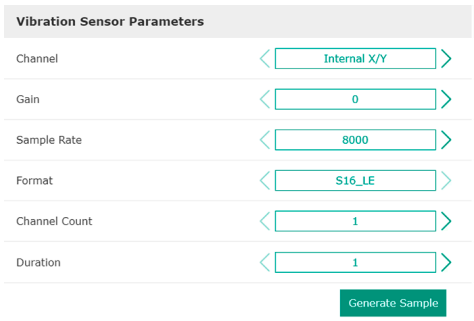
Update device's license

The Digital Data Interface comprises three different system modes: "DDI", "LPI" and "LSI" as well as different fieldbus types. The possible system modes and fieldbus types are enabled via the license key. This function also updates the license.

1. Click "Browse" next to "Select license file".
2. Select the location of the file in the selection window.
3. Select file.
4. Click on "Open" in the selection window.
5. Click "Save".

- ► The license is loaded.
- ► Once the license is loaded, the message "License is updated successfully" is displayed.

7.3 Vibration Sample



The existing vibration sensors record the vibrations of the pump at any time. With Vibration Sample, the acquired data can be saved in a wav file.

→ Channel
Selection of the sensor to be acquired.
Factory setting: Internal X/Y
Input:
- Internal X/Y: Vibration sensor X/Y in DDI
- Internal Z: Vibration sensor in DDI
- Extern X/Y: External vibration sensor at input 1 or 2

→ Gain
Gain of the recorded signal up to approx. 60 dB.
Factory setting: 0 %
Input: 0 ... 100 % (corresponds to 0 ... 59.5 dB)

Example calculation:
- Gain: Factor 2
- Calculation: $20\log_{10}(2) = 6.02$ dB
- Value to be set: 10 (= 10 %)

→ Sample Rate
Factory setting: 8000 Hz
Input: 8000 Hz, 16000 Hz, 44100 Hz

→ Format
Factory setting: S16_LE (Signed 16 Bit Little Endian)

→ Channel Count
Selection of the channel to be acquired.
Factory setting: 1
Input: 1 (Internal X / Internal Z / External 1), 2 (Internal X and Y / External 1 and 2)

→ Duration
Recording time
Factory setting: 1 s
Input: 1 ... 5 s

To start the measurement, click "Generate Sample".

7.4 Documentation

The following information can be displayed:

→ Typeplate Data
Illustration of technical data.

→ Instruction Manual
Installation and operating instructions in PDF format.

→ Hydraulic Data
Test report in PDF format.

The maintenance and installation logbook is additionally available using the "Regular user" user account:

→ Maintenance Logbook
Plain text field to record individual maintenance work.

→ Installation Logbook
Plain text field to describe installation. The "Name of the installation site" is displayed on the home page.

NOTICE! Comply with data protection regulations! Do not record any personal data in the maintenance and installation logbook.

7.5 Licences

Overview of all licences used and the corresponding version ("License" main menu).

8 Faults, causes and remedies

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.

8.1 Error types

The Digital Data Interface distinguishes between five different prioritisations for alarm and warning messages:

- → Alert Type A
- → Alert Type B
- → Warning Type C
- → Warning Type D
- → Message Type I

NOTICE! The functionality of the alarms and warnings depends on the system mode!

8.1.1 Error types: DDI and LPI system mode

Functionality of the various alarm and warning messages:

- → Alert Type A: The pump is **switched off** in the event of a fault. Reset the alarm signal **manually**:
  - – "Reset Error" on the home page
  - – Function "Reset" at a digital input of the frequency converter **or** I/O module
  - – Corresponding signal via fieldbus
- → Alert Type B: The pump is **switched off** in the event of a fault. When the fault is corrected, the alarm signal is automatically reset.
- → Warning Type C: These warnings can switch a relay output of the frequency converter **or** the I/O module.
- → Warning Type D: These warnings are only displayed and logged.
- → Message Type I: Information about operating status.

8.1.2 Error types: LSI system mode

Functionality of the various alarm and warning messages:

- → Alert Type A: In the event of a fault, the pump is **not** switched off. Reset the alarm signal **manually**:
  - – "Master Reset" on the Master home page
  - – Function "Reset" at a digital input of the **I/O modules**
  - – Corresponding signal via fieldbus
- → Alert Type B: In the event of a fault, the pump is **not** switched off. When the fault is corrected, the alarm signal is automatically reset.
  NOTICE! The dry-running protection always switches off the pump!
- → Warning Type C: These warnings can switch a relay output of the **I/O module**.
- → Warning Type D: These warnings are only displayed and logged.
- → Message Type I: Information about operating status.

8.2 Error codes

Code	Type	Fault	Cause	Remedy
100.x	A	Pump Unit Offline (SERIAL NUMBER)	The connection to the specified pump cannot be established.	Check network connection. Check network settings.
101	A	Master Changed (SERIAL NUMBER)	The Master pump was changed due to the predefined change strategy or a communication error.	Check change strategy in the Master settings. Check network connection.
200	B	Alarm in Pump (SERIAL NUMBER)	Alarm at the specified pump.	Check the error log of the specified pump.
201	B	Dry Run	Dry-running level reached	Check the operating parameters of the system. Check level settings. Check the settings of the digital inputs.
202	B	High Water	High water level reached	Check the operating parameters of the system. Check level settings. Check the settings of the digital inputs.
203	B	Sensor Error	Measured value is outside the measurement range, sensor defective.	Contact customer service.
400	C	Warning in Pump (SERIAL NUMBER)	Warning for the specified pump.	Check the error log of the specified pump.

Code	Type	Fault	Cause	Remedy
500	D	Pipe Sedimentation High	Blockage in the piping. After detection, a flushing cycle is started at maximum frequency for the next pump cycles. If the permissible ratio (Admissible Flow Ratio for Sedimentation) is exceeded, flushing is terminated.	Check piping, remove blockages. Check "High Efficiency(HE) Controller" settings.
501	D	Comm. Error I/O Extension	Communication with I/O module failed.	Check network connection. Check I/O module. Check settings for the I/O module in the Master settings.
900	I	More than 4 Pumps in System	Maximum number of pumps in the system exceeded.	Integrate a maximum of 4 pumps into the system.
901	I	Pump removed from System (SERIAL NUMBER)	Pump has been removed from the system.	Check network connection.
902	I	Pipe Measurement Incomplete	Calculation of piping parameters was not successfully executed.	Check settings under High Efficiency(HE) Controller/Pipe Settings and recalculate. If the message is still displayed, contact customer service.
903	I	Pipe Calculation Timeout	Calculation of piping parameters was aborted due to a timeout.	Check settings under High Efficiency(HE) Controller/Pipe Settings and recalculate. If the message is still displayed, contact customer service.
904	I	Pipe Settings / Calculation Missing	Calculation of piping parameters has not yet been carried out. HE controller cannot be activated.	Input settings under High Efficiency(HE) Controller/Pipe Settings and start calculation.
1000	A	Motor Safe Stop Alarm	"Safe Torque Off" active.	Check connection: 24 VDC must apply at terminal 37 of the frequency converter. A manual reset is required once the fault has been eliminated! Installation in potentially explosive atmospheres: Check switch-off parameters (thermal motor monitoring, dry-running protection).
1001	A	Motor Ground Fault Alarm	Short circuit to earth between an output phase and earth (between frequency converter and motor or directly in the motor)	Have the electrical connection at the frequency converter checked by a qualified electrician. Have the electrical connection at the motor checked by a qualified electrician.
1002	A	Motor Short Circuit Alarm	Short circuit in motor or at motor connection	Have the electrical connection at the motor checked by a qualified electrician.
2000	B	Motor Vibration X – Trip	Vibration limit value exceeded.	Check pump and installation (e.g. not running smoothly, poor duty point, distorted installation). Check vibration limit values in the Digital Data Interface and correct if necessary.
2001	B	Motor Vibration Y – Trip	Vibration limit value exceeded.	Check pump and installation (e.g. not running smoothly, poor duty point, distorted installation). Check vibration limit values in the Digital Data Interface and correct if necessary.
2002	B	Motor Vibration Z – Trip	Vibration limit value exceeded.	Check pump and installation (e.g. not running smoothly, poor duty point, distorted installation). Check vibration limit values in the Digital Data Interface and correct if necessary.
2003	B	Vibration Input 1 – Trip	Vibration limit value exceeded.	Check pump and installation (e.g. not running smoothly, poor duty point, distorted installation). Check vibration limit values in the Digital Data Interface and correct if necessary.

Code	Type	Fault	Cause	Remedy
2004	B	Vibration Input 2 – Trip	Vibration limit value exceeded.	Check pump and installation (e.g. not running smoothly, poor duty point, distorted installation). Check vibration limit values in the Digital Data Interface and correct if necessary.
2005	B	FC Overload Alarm	Temperature sensor of the performance card records excessive or insufficient temperature.	Check frequency converter ventilation.
2005	B	FC Overload Alarm	Switch-off temperature (75 °C) of the control card reached.	Check frequency converter ventilation.
2005	B	FC Overload Alarm	Inverter overload	Compare rated current: – Compare output current displayed at LCP with rated current of the frequency converter – Compare the output current displayed at the LCP with measured motor current Display thermal load on LCP and monitor value: – If the frequency converter is operated **above** the permanent rated current, the counter increases. – If the frequency converter is operated **below** the permanent rated current, the counter decreases.
2006	B	FC Line Alarm	Mains connection: one phase is missing	Have the electrical connection at the frequency converter checked by a qualified electrician. Have the electrical connection at the motor checked by a qualified electrician.
2006	B	FC Line Alarm	Mains connection: excessive phase asymmetry	Have the electrical connection at the frequency converter checked by a qualified electrician. Have the electrical connection at the motor checked by a qualified electrician.
2006	B	FC Line Alarm	Motor connection: one phase is missing	Have the electrical connection at the frequency converter checked by a qualified electrician. Have the electrical connection at the motor checked by a qualified electrician.
2007	B	FC DC Circuit Alarm	Overvoltage	Extend ramp time for brake ramp.
2007	B	FC DC Circuit Alarm	Undervoltage	Have the electrical connection at the frequency converter checked by a qualified electrician. Check the pre-charge circuit.
2008	B	FC Supply Alarm	No supply voltage at frequency converter	Have the electrical connection at the frequency converter checked by a qualified electrician.
2008	B	FC Supply Alarm	External 24 VDC supply overloaded	Have the electrical connection at the frequency converter checked by a qualified electrician.
2008	B	FC Supply Alarm	1.8 VDC supply of the control card outside tolerance range.	Have the electrical connection at the frequency converter checked by a qualified electrician.
3000	A/B	Dry Run Detected	Tank fill level has reached a critical level.	Check installation (e.g. inlet, outlet, level settings). Check digital input settings.
3001	A/B	Leakage Input Alarm	Leakage detected	Check the external electrode (optional) function. Change the oil in the sealing chamber. Check digital input settings.
3002	A/B	Temp. Sensor 1 Trip	Winding temperature limit reached	Check motor for overload. Check motor cooling. Check temperature limit values in Digital Data Interface and correct if necessary.
3003	A/B	Temp. Sensor 2 Trip	Winding temperature limit reached	Check motor for overload. Check motor cooling. Check temperature limit values in Digital Data Interface and correct if necessary.

Code	Type	Fault	Cause	Remedy
3004	A/B	Temp. Sensor 3 Trip	Winding temperature limit reached	Check motor for overload. Check motor cooling. Check temperature limit values in Digital Data Interface and correct if necessary.
3005	A/B	Temp. Sensor 4 Trip	Bearing temperature limit value reached	For dry well installation: Check ambient temperature, keep to maximum value. Check temperature limit values in Digital Data Interface and correct if necessary.
3006	A/B	Temp. Sensor 5 Trip	Bearing temperature limit value reached	For dry well installation: Check ambient temperature, keep to maximum value. Check temperature limit values in Digital Data Interface and correct if necessary.
3007	A/B	Motor Overload	Torque limit reached	If the system exceeds the motor's torque limit during the acceleration ramp, extend the time for the acceleration ramp. If the system exceeds the generator's torque limit during the brake ramp, extend the time for the brake ramp. If the torque limit is reached during operation, increase the torque limit. Make sure the system can be operated with a higher torque, if necessary, contact customer service. Excessive motor current consumption, check operating conditions.
3007	A/B	Motor Overload	Excess current	Disconnect the motor from the mains connection and turn the shaft by hand. Contact customer service if it is not possible to turn the shaft by hand. Check the motor power/frequency converter configuration. Contact customer service if the motor power is too high. Check parameters 1-20 to 1-25 in the frequency converter for correct motor data and adapt if necessary.
3008	A/B	Motor Overtemp.	Thermal motor monitoring has triggered.	Motor overheated, check cooling and operating conditions. Check motor for mechanical overload. Check thermal motor monitoring connection (frequency converter: terminal 33 and terminal 50 (+10 VDC). Check parameters 1-93 "Thermistor Source" in the frequency converter if a thermal switch or thermistor is used: Value must correspond to sensor wiring.
4000	C	High Water Detected	Tank fill level has reached a critical level.	Check installation (e.g. inlet, outlet, level settings). Check digital input settings.
4001	C	Leakage Input Warning	Leakage detected	Check the external electrode (optional) function. Change the oil in the sealing chamber. Check digital input settings.
4002	C	Temp. Sensor 1 Fault	Sensor faulty, measured value outside measurement range.	Contact customer service.
4003	C	Temp. Sensor 2 Fault	Sensor faulty, measured value outside measurement range.	Contact customer service.
4004	C	Temp. Sensor 3 Fault	Sensor faulty, measured value outside measurement range.	Contact customer service.
4005	C	Temp. Sensor 4 Fault	Sensor faulty, measured value outside measurement range.	Contact customer service.

Code	Type	Fault	Cause	Remedy
4006	C	Temp. Sensor 5 Fault	Sensor faulty, measured value outside measurement range.	Contact customer service.
4007	C	Internal Vibration Sensor Fault	Sensor faulty, measured value outside measurement range.	Contact customer service.
4008	C	Current Sensor 1 Fault	Sensor faulty, measured value outside measurement range.	Contact customer service.
4009	C	Current Sensor 2 Fault	Sensor faulty, measured value outside measurement range.	Contact customer service.
4010	C	Onboard Temp. Sensor Fault	Sensor faulty, measured value outside measurement range.	Contact customer service.
4011	C	Temp. Sensor 1 Warning	Winding temperature limit reached.	Check motor for overload. Check motor cooling. Check temperature limit values in Digital Data Interface and correct if necessary.
4012	C	Temp. Sensor 2 Warning	Winding temperature limit reached.	Check motor for overload. Check motor cooling. Check temperature limit values in Digital Data Interface and correct if necessary.
4013	C	Temp. Sensor 3 Warning	Winding temperature limit reached.	Check motor for overload. Check motor cooling. Check temperature limit values in Digital Data Interface and correct if necessary.
4014	C	Temp. Sensor 4 Warning	Bearing temperature limit reached.	For dry well installation: Check ambient temperature, keep to maximum value. Check temperature limit values in Digital Data Interface and correct if necessary.
4015	C	Temp. Sensor 5 Warning	Bearing temperature limit reached.	For dry well installation: Check ambient temperature, keep to maximum value. Check temperature limit values in Digital Data Interface and correct if necessary.
4016	C	Temp. On Board Warning	Temperature limit value reached in Digital Data Interface.	Check motor for overload. Check motor cooling.
4017	C	General FC Alarm	"Terminal 50" frequency converter: Voltage <10 V	Remove cable at terminal 50: – If the frequency converter no longer shows the warning, there is a problem with the customer's wiring. – If the frequency converter continues to show the warning, replace the control card.
4017	C	General FC Alarm	No motor connected to the frequency converter output.	Connect motor.
4017	C	General FC Alarm	Motor overload	Motor overheated, check cooling and operating conditions. Check motor for mechanical overload.
4017	C	General FC Alarm	Speed limit reached.	Check operating conditions.
4017	C	General FC Alarm	Voltage limit reached.	Check operating conditions.
4017	C	General FC Alarm	Temperature of the frequency converter too cold for operation.	Check temperature sensor in frequency converter. Check sensor cable between IGBT and Gate actuation card.
4018	C	Motor Ground Fault Warning	Short circuit to earth between an output phase and earth (between frequency converter and motor or directly in the motor)	Have the electrical connection at the frequency converter checked by a qualified electrician. Have the electrical connection at the motor checked by a qualified electrician.

Code	Type	Fault	Cause	Remedy
4019	C	Motor Overload	Torque limit reached	If the system exceeds the motor's torque limit during the acceleration ramp, extend the time for the acceleration ramp. If the system exceeds the generator's torque limit during the brake ramp, extend the time for the brake ramp. If the torque limit is reached during operation, increase the torque limit. Make sure the system can be operated with a higher torque, if necessary, contact customer service. Excessive motor current consumption, check operating conditions.
4019	C	Motor Overload	Excess current	Disconnect the motor from the mains connection and turn the shaft by hand. Contact customer service if it is not possible to turn the shaft by hand. Check the motor power/frequency converter configuration. Contact customer service if the motor power is too high. Check parameters 1-20 to 1-25 in the frequency converter for correct motor data and adapt if necessary.
4020	C	Motor Overtemp.	Thermal motor monitoring has triggered.	Motor overheated, check cooling and operating conditions. Check motor for mechanical overload. Check thermal motor monitoring connection (frequency converter: terminal 33 and terminal 50 (+10 VDC). Check parameters 1-93 "Thermistor Source" in the frequency converter if a thermal switch or thermistor is used: Value must correspond to sensor wiring.
4022	C	Motor Safe Stop Warning	"Safe Torque Off" active.	Check connection: 24 VDC must apply at terminal 37 of the frequency converter. A manual reset is required once the fault has been eliminated! Installation in potentially explosive atmospheres: Check switch-off parameters (thermal motor monitoring, dry-running protection).
4024	C	FC Overload Warning	Temperature sensor of the performance card records excessive or insufficient temperature.	Check frequency converter ventilation.
4024	C	FC Overload Warning	Switch-off temperature (75 °C) of the control card reached.	Check frequency converter ventilation.
4024	C	FC Overload Warning	Inverter overload	Compare rated current: - Compare output current displayed at LCP with rated current of the frequency converter - Compare the output current displayed at the LCP with measured motor current Display thermal load on LCP and monitor value: - If the frequency converter is operated **above** the permanent rated current, the counter increases. - If the frequency converter is operated **below** the permanent rated current, the counter decreases. Check parameters 1-20 to 1-25 in the frequency converter for correct motor data and adapt if necessary.
4025	C	FC Line Warning	Mains connection: one phase is missing	Have the electrical connection at the frequency converter checked by a qualified electrician. Have the electrical connection at the motor checked by a qualified electrician.

Code	Type	Fault	Cause	Remedy
4025	C	FC Line Warning	Mains connection: excessive phase asymmetry	Have the electrical connection at the frequency converter checked by a qualified electrician. Have the electrical connection at the motor checked by a qualified electrician.
4025	C	FC Line Warning	Motor connection: one phase is missing	Have the electrical connection at the frequency converter checked by a qualified electrician. Have the electrical connection at the motor checked by a qualified electrician.
4026	C	FC DC Circuit Warning	Overvoltage	Extend ramp time for brake ramp.
4026	C	FC DC Circuit Warning	Undervoltage	Have the electrical connection at the frequency converter checked by a qualified electrician. Check the pre-charge circuit.
4027	C	FC Supply Warning	No supply voltage at frequency converter	Have the electrical connection at the frequency converter checked by a qualified electrician.
4027	C	FC Supply Warning	External 24 VDC supply overloaded	Have the electrical connection at the frequency converter checked by a qualified electrician.
4027	C	FC Supply Warning	1.8 VDC supply of the control card outside tolerance range.	Have the electrical connection at the frequency converter checked by a qualified electrician.
4028	C	FC Communication Warning	Control word timeout	Check Ethernet connection. Increase parameter 8-03 "Control Timeout Time" in frequency converter. Check communication device function. Check if wiring is EMC-compliant.
4029	C	General FC Warning	"Terminal 50" frequency converter: Voltage <10 V	Remove cable at "terminal 50": - If the frequency converter no longer shows the warning, there is a problem with the customer's wiring. - If the frequency converter continues to show the warning, replace the control card.
4029	C	General FC Warning	No motor connected to the frequency converter output.	Connect motor.
4029	C	General FC Warning	Motor overload	Motor overheated, check cooling and operating conditions. Check motor for mechanical overload.
4029	C	General FC Warning	Speed limit reached.	Check operating conditions.
4029	C	General FC Warning	Voltage limit reached.	Check operating conditions.
4029	C	General FC Warning	Temperature of the frequency converter too cold for operation.	Check temperature sensor in frequency converter. Check sensor cable between IGBT and Gate actuation card.
4030	C	EXIO Communication Down	Communication with I/O module failed.	Check the I/O module settings at the Digital Data Interface. Check the settings in the I/O module. Check Ethernet connection.
4031	C	FC Communication Down	Communication with frequency converter failed.	Check the frequency converter settings at the Digital Data Interface. Check settings in the frequency converter. Check Ethernet connection.
4034	C	Leakage Detected 1	Leakage detected in leakage chamber.	Drain leakage chamber.
4035	C	Leakage Detected 2	Leakage detected in sealing chamber.	Change the oil in the sealing chamber.

Code	Type	Fault	Cause	Remedy
5000	D	Clog Detection Teach Failure	Teach-in process not completed: - Pump switched to manual mode or pump stopped during teach-in process. - Timeout because setpoint frequency has not been reached.	Check pump for clogging. Make sure the level in the run-down tank is sufficient. Check the settings for the teach-in process in the Digital Data Interface.
6000	C/D	Emerged Operation - Limit Temperature	Adjusted temperature value reached.	Check the settings of the "Non-immersed operation" function in the Digital Data Interface.
6001	C/D	Clog Detection	Potential deposits in the hydraulics	Activate "Cleaning sequence" function.
6002	C/D	Motor Vibration X - Warning	Vibration limit value exceeded.	Check pump and installation (e.g. not running smoothly, poor duty point, distorted installation). Check vibration limit values in the Digital Data Interface and correct if necessary.
6003	C/D	Motor Vibration Y - Warning	Vibration limit value exceeded.	Check pump and installation (e.g. not running smoothly, poor duty point, distorted installation). Check vibration limit values in the Digital Data Interface and correct if necessary.
6004	C/D	Motor Vibration Z - Warning	Vibration limit value exceeded.	Check pump and installation (e.g. not running smoothly, poor duty point, distorted installation). Check vibration limit values in the Digital Data Interface and correct if necessary.
6005	C/D	Vibration Input 1 - Warning	Vibration limit value exceeded.	Check pump and installation (e.g. not running smoothly, poor duty point, distorted installation). Check vibration limit values in the Digital Data Interface and correct if necessary.
6006	C/D	Vibration Input 2 - Warning	Vibration limit value exceeded.	Check pump and installation (e.g. not running smoothly, poor duty point, distorted installation). Check vibration limit values in the Digital Data Interface and correct if necessary.
8001	D	Auto Setup Failed	Unable to complete automatic parameter configuration.	Frequency converter set to "Stop". Check the frequency converter settings in the Digital Data Interface and restart automatic parameter configuration.
8002	D	Auto Setup Timed Out	2 minute time limit exceeded.	Frequency converter set to "Stop". Check the frequency converter settings in the Digital Data Interface and restart automatic parameter configuration.
10004	I	Pump Kick is Running	Pump has exceeded the permissible standstill time.	
10005	I	Cleaning-Cycle is Running	Cleaning sequence in progress: - Prior to each pumping process - Clogging detected	
10006	I	Teach was Successful	Teach-in process for clogging detection completed.	
10007	I	Update Succeeded	Update completed.	
10008	I	Update Failed	Unable to complete update.	Contact customer service.

9 Appendix

9.1 Fieldbus: Parameter overview

The individual fieldbus parameters for the fieldbus types Modbus TCP and OPC UA are listed below.

NOTICE! The parameters for the LSI master are listed for each fieldbus type in a separate table!

NOTICE! For the fieldbus "ModBus TCP", the slave number is: 255, Port: 502!

Explanations for individual parameter groups in the system mode DDI, LPI and LSI (Slave)

- Parameter group Status
  Includes information on operating status, warnings and alarms.
- Parameter group Motor Information
  Includes information about motor ratings, motor and hydraulic type, pump serial number as well as minimum and maximum frequency.
- Parameter group Sensor Locations/Types
  Contains information about the sensor types (temperature, current and vibration) and their installation.
- Parameter group Data Readouts
  Contains the current sensor values, operating hours, pump and cleaning cycles as well as the energy consumption of the pump.
- Parameter group Time
  Contains information about the date and time.
- Parameter group Control Word
  Contains the settings of the pump operation mode, setpoint frequency, ramp times, pump enable and pump functions.
- Parameter group Sensor Trip/Warning
  Contains the threshold settings for the temperature and vibration sensors.

Explanations for individual parameter groups in the system mode LSI (Master)

- Parameter group System Variables
  Includes information on system operating status, system warnings and system alarms.
- Parameter group Analog Variables
  Contains the current fill level values, pressure and flow as well as the frequency and number of running pumps in the system.
- Parameter group Data Time Variables
  Contains information about the date and time.
- Parameter group Pump 1 ... Pump 4
  Contains information about the individual pump: Serial number, motor and hydraulic type, status, warnings, alarms, current performance, operating hours, number of pump and cleaning cycles, kWh counter.
- Parameter group Control Word
  Includes the releases for PID control, for draining the tank and for the alternative start level.
- Parameter group Modes
  Contains the settings of the system operating mode and the control mode in automatic mode.
- Parameter group PID Setpoint
  Contains the setting for the PID setpoint.

See also

- ModBus TCP: DDI/LPI/LSI Slave-Parameter [▶ 168]
- OPC-UA: DDI/LPI/LSI Slave-Parameter [▶ 173]
- ModBus TCP: LSI Master-Parameter [▶ 178]
- OPC-UA: LSI Master-Parameter [▶ 182]

9.1.1 ModBus TCP: DDI/LPI/LSI Slave-Parameter

Group	Symbol	Register Type	Address in DDI	Address in LPI	Address in LSI	Size	Data Type	Scaling	Bit	Bit-Function	Description
Status	MB_Status_Word	Input Registers	0	0	0	1	UINT	Bitfield	0	Run	
									1	Rising_Water_Level	
									2	Falling_Water_Level	
									3	External_Off	
									4	Pump_Kick_Running	
									5	Anticlog_Running	
									6		
									7		
									8		
									9		
									10		
									11		
									12	Warning_TypeD_Active	only in LSI available
									13	Warning_TypeC_Active	only in LSI available
									14	Err_TypeB_Active	only in LSI available
									15	Err_TypeA_Active	only in LSI available
Status	MS_Warning_Word_MSB	Input Registers	1	1	1	2	DWORD (High - Low)	Bitfield	0	Comm_Error_Fieldbus_OPCUA	
									1	Thermostat_Mode_Limit_temperature	
									2	Clog_Detection	
									3	Vibration_X_warning	
									4	Vibration_Y_warning	
									5	Vibration_Z_warning	
									6	Vibration_1_warning	
									7	Vibration_2_warning	
Status	MS_Warning_Word_LSB	Input Registers	3	3	3	2	DWORD (High - Low)	Bitfield	0	High_Water_detected	
									1	Leackage_input	
									2	Temp_1_fault	
									3	Temp_2_fault	
									4	Temp_3_fault	
									5	Temp_4_fault	
									6	Temp_5_fault	
									7	Internal_Vibration_fault	
									8	Current_Input_1_fault	
									9	Current_Input_2_fault	
									10	Onboard_Temp_fault	
									11	Temp_1	
									12	Temp_2	
									13	Temp_3	
									14	Temp_4	
									15	Temp_5	
									16	Onboard_Temp	
									17	AMA_not_OK	
									18	General_FC	
									19	Motor_Ground_Fault	
									20	Motor_Overload	
									21	Motor_Overtemp	
									22	Motor_Short	

Group	Symbol	Register Type	Address in DDI	Address in LPI	Address in LSI	Size	Data Type	Scaling	Bit	Bit-Function	Description
									23	Safe_Stop	
									24	FC_Overload	
									25	FC_Line	
									26	FC_DC_Circuit	
									27	FC_Supply	
									28	FC_Communication	
									29	Comm_Error_IO_Extension	
									30	Comm_Error_FC	
									31	Comm_Error_Fieldbus_Modbus_Slave	
Status	MS_Alarm_Word_MSB	Input Registers	5	5	5	2	DWORD (High - Low)	Bitfield			no content
Status	MS_Alarm_Word_LSB	Input Registers	7	7	7	2	DWORD (High - Low)	Bitfield	0	Motor_Ground_Fault	
									1	Motor_Short	
									2	Safe_Stop	
									3	Vibration_X_trip	
									4	Vibration_Y_trip	
									5	Vibration_Z_trip	
									6	Vibration_1_trip	
									7	Vibration_2_trip	
									8	FC_Overload	
									9	FC_Line	
									10	FC_DC_Circuit	
									11	FC_Supply	
									12	Dry_Run_detected	
									13	Leackage_input_alarm	
									14	Temp_Sensor_1_trip	
									15	Temp_Sensor_2_trip	
									16	Temp_Sensor_3_trip	
									17	Temp_Sensor_4_trip	
									18	Temp_Sensor_5_trip	
									19	Motor_Overload	
									20	Motor_Overtemp	
									21	General_FC	
									22	FC_Communication	
									23	AMA_Not_OK	
Motor Information	NP_Serial_Number	Input Registers	1000	1000	1000	8	String(16)	-			
Motor Information	NP_Motor_Type	Input Registers	1008	1008	1008	16	String(32)	-			
Motor Information	NP_Pump_Type	Input Registers	1024	1024	1024	16	String(32)	-			
Motor Information	NP_Nominal_Pwr	Input Registers	1040	1040	1040	2	FLOAT32 (High - Low)	-			
Motor Information	NP_Nominal_Volt	Input Registers	1042	1042	1042	2	FLOAT32 (High - Low)	-			
Motor Information	NP_Nominal_Curr	Input Registers	1044	1044	1044	2	FLOAT32 (High - Low)	-			
Motor Information	NP_Nominal_Freq	Input Registers	1046	1046	1046	2	FLOAT32 (High - Low)	-			
Motor Information	NP_Max_St_Per_Hour	Input Registers	1048	1048	1048	2	FLOAT32 (High - Low)	-			
Motor Information	NP_Max_Freq	Input Registers	1050	1050	1050	2	FLOAT32 (High - Low)	-			
Motor Information	NP_Min_Freq	Input Registers	1052	1052	1052	2	FLOAT32 (High - Low)	-			
Sensor Locations/Types	SI_Temperature[1].Location	Input Registers	2000	2000	2000	1	UINT	ENUM			0=unused / 1=winding_top / 2=winding_bottom / 3=bearing_top / 4=bearing_bottom / 5=cooling_liquid / 6=motor_laminations

Group	Symbol	Register Type	Address in DDI	Address in LPI	Address in LSI	Size	Data Type	Scaling	Bit	Bit-Function	Description
Sensor Locations/Types	SI_Temperature[2].Location	Input Registers	2001	2001	2001	1	UINT	ENUM			0=unused / 1=winding_top / 2=winding_bottom / 3=bearing_top / 4=bearing_bottom / 5=cooling_liquid / 6=motor_laminations
Sensor Locations/Types	SI_Temperature[3].Location	Input Registers	2002	2002	2002	1	UINT	ENUM			0=unused / 1=winding_top / 2=winding_bottom / 3=bearing_top / 4=bearing_bottom / 5=cooling_liquid / 6=motor_laminations
Sensor Locations/Types	SI_Temperature[4].Location	Input Registers	2003	2003	2003	1	UINT	ENUM			0=unused / 1=winding_top / 2=winding_bottom / 3=bearing_top / 4=bearing_bottom / 5=cooling_liquid / 6=motor_laminations
Sensor Locations/Types	SI_Temperature[5].Location	Input Registers	2004	2004	2004	1	UINT	ENUM			0=unused / 1=winding_top / 2=winding_bottom / 3=bearing_top / 4=bearing_bottom / 5=cooling_liquid / 6=motor_laminations
Sensor Locations/Types	SI_VibrationExtern1.Location	Input Registers	2005	2005	2005	1	UINT	ENUM			0=unused / 1=motor_hut_x / 2=motor_hut_y / 3=bearing_top_x / 4=bearing_ top_y / 5=bearing_bottom_x / 6=bearing_bottom_y
Sensor Locations/Types	SI_VibrationExtern2.Location	Input Registers	2006	2006	2006	1	UINT	ENUM			0=unused / 1=motor_hut_x / 2=motor_hut_y / 3=bearing_top_x / 4=bearing_ top_y / 5=bearing_bottom_x / 6=bearing_bottom_y
Sensor Locations/Types	SI_Current[0].Sensor_Type	Input Registers	2007	2007	2007	1	UINT	ENUM			0=unused / 1=current_signal_only / 2=leackage_ switch / 3=sealing_CLP_V01 / 4=leackage_CLP_V01
Sensor Locations/Types	SI_Current[1].Sensor_Type	Input Registers	2008	2008	2008	1	UINT	ENUM			0=unused / 1=current_signal_only / 2=leackage_ switch / 3=sealing_CLP_V01 / 4=leackage_CLP_V02
Data Readouts	IO_Temperature[1].Value	Input Registers	3000	3000	3000	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_Temperature[2].Value	Input Registers	3002	3002	3002	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_Temperature[3].Value	Input Registers	3004	3004	3004	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_Temperature[4].Value	Input Registers	3006	3006	3006	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_Temperature[5].Value	Input Registers	3008	3008	3008	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_Temperature[0].Value	Input Registers	3010	3010	3010	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_Current[0].Value	Input Registers	3012	3012	3012	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_Current[1].Value	Input Registers	3014	3014	3014	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_Vibration[0].Value	Input Registers	3016	3016	3016	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_Vibration[1].Value	Input Registers	3018	3018	3018	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_Vibration[2].Value	Input Registers	3020	3020	3020	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_Vibration[3].Value	Input Registers	3022	3022	3022	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_Vibration[4].Value	Input Registers	3024	3024	3024	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_FC_Power.Value	Input Registers	-	3026	3026	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_FC_Voltage.Value	Input Registers	-	3028	3028	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_FC_Current.Value	Input Registers	-	3030	3030	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_FC_Frequency.Value	Input Registers	-	3032	3032	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_Level.Value	Input Registers	3026	3034	3034	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_Pressure.Value	Input Registers	3028	3036	3036	2	FLOAT32 (High - Low)	-			
Data Readouts	IO_Flow.Value	Input Registers	3030	3038	3038	2	FLOAT32 (High - Low)	-			
Data Readouts	RT_RUNNING_TIME_RTN	Input Registers	3032	3040	3040	2	DWORD (High - Low)	1			
Data Readouts	RT_PUMP_CYCLE_CNT_RTN	Input Registers	3034	3042	3042	2	DWORD (High - Low)	1			
Data Readouts	RT_CLEANING_CYCLE_CNT_RTN	Input Registers	-	3044	3044	2	DWORD (High - Low)	1			
Data Readouts	RT_ENERGY_CONSUMPTION	Input Registers	-	3046	3046	2	DWORD (High - Low)	1			
Time	RI_System_Current_Year	Input Registers	4000	4000	4000	1	UINT	1			
Time	RI_System_Current_Month	Input Registers	4001	4001	4001	1	UINT	1			
Time	RI_System_Current_Day	Input Registers	4002	4002	4002	1	UINT	1			
Time	RI_System_Current_Hour	Input Registers	4003	4003	4003	1	UINT	1			
Time	RI_System_Current_Minute	Input Registers	4004	4004	4004	1	UINT	1			

Group	Symbol	Register Type	Address in DDI	Address in LPI	Address in LSI	Size	Data Type	Scaling	Bit	Bit-Function	Description
Time	RI_System_Current_Second	Input Registers	4005	4005	4005	1	UINT	1			
Time	RI_System_Uptime	Input Registers	4006	4006	4006	2	DWORD (High - Low)	1			
Time	RI_System_Current_Ms	Input Registers	4008	4008	4008	2	DWORD (High - Low)	1			
Control Word	MB_Control_Word	Holding Registers	0	0	0	1	UINT	Bitfield	0	Reset	
									1	Start	Applies only for LPI
									2		
									3		
									4		
									5		
									6		
									7		
									8		
									9		
									10		
									11		
									12		
									13		
									14		
									15	Save_Config	Rising edge of this Bit is needed after changing a parameter of the group *Control Word*. This is not applicable for *Reset, Start and MB_Bus_Control_Value*
Control Word	MB_Bus_Control_Value	Holding Registers	-	1	1	1	UINT	100			
Control Word	MB_Operation_Mode	Holding Registers	-	2	2	1	UINT	ENUM			0=manual / 1=auto / 2=off
Control Word	MB_Manual_Frequency	Holding Registers	-	3	3	1	UINT	100			
Control Word	MB_FC_Ramp_Up_Time	Holding Registers	-	4	4	1	UINT	100			
Control Word	MB_FC_Ramp_Down_Time	Holding Registers	-	5	5	1	UINT	100			
Control Word	MB_Enable_Pump_Kick	Holding Registers	-	7	7	1	UINT	ENUM			0=off / 1=on
Control Word	MB_Enable_Thermostat_Mode	Holding Registers	-	6	6	1	UINT	ENUM			0=off / 1=on
Control Word	MB_Allow_Anticlog	Holding Registers	-	8	8	1	UINT	ENUM			0=off / 1=on
Sensor Trip/Warning	MB_Temp_Sensors[0].Warning	Holding Registers	1000	1000	1000	1	UINT	10			
Sensor Trip/Warning	MB_Temp_Sensors[0].Trip	Holding Registers	1001	1001	1001	1	UINT	10			
Sensor Trip/Warning	MB_Temp_Sensors[1].Warning	Holding Registers	1002	1002	1002	1	UINT	10			
Sensor Trip/Warning	MB_Temp_Sensors[1].Trip	Holding Registers	1003	1003	1003	1	UINT	10			
Sensor Trip/Warning	MB_Temp_Sensors[2].Warning	Holding Registers	1004	1004	1004	1	UINT	10			
Sensor Trip/Warning	MB_Temp_Sensors[2].Trip	Holding Registers	1005	1005	1005	1	UINT	10			
Sensor Trip/Warning	MB_Temp_Sensors[3].Warning	Holding Registers	1006	1006	1006	1	UINT	10			
Sensor Trip/Warning	MB_Temp_Sensors[3].Trip	Holding Registers	1007	1007	1007	1	UINT	10			
Sensor Trip/Warning	MB_Temp_Sensors[4].Warning	Holding Registers	1008	1008	1008	1	UINT	10			
Sensor Trip/Warning	MB_Temp_Sensors[4].Trip	Holding Registers	1009	1009	1009	1	UINT	10			
Sensor Trip/Warning	MB_Vib_Sensors[0].Warning	Holding Registers	1010	1010	1010	1	UINT	10			
Sensor Trip/Warning	MB_Vib_Sensors[0].Trip	Holding Registers	1011	1011	1011	1	UINT	10			
Sensor Trip/Warning	MB_Vib_Sensors[1].Warning	Holding Registers	1012	1012	1012	1	UINT	10			
Sensor Trip/Warning	MB_Vib_Sensors[1].Trip	Holding Registers	1013	1013	1013	1	UINT	10			
Sensor Trip/Warning	MB_Vib_Sensors[2].Warning	Holding Registers	1014	1014	1014	1	UINT	10			
Sensor Trip/Warning	MB_Vib_Sensors[2].Trip	Holding Registers	1015	1015	1015	1	UINT	10			
Sensor Trip/Warning	MB_Vib_Sensors[3].Warning	Holding Registers	1016	1016	1016	1	UINT	10			
Sensor Trip/Warning	MB_Vib_Sensors[3].Trip	Holding Registers	1017	1017	1017	1	UINT	10			
Sensor Trip/Warning	MB_Vib_Sensors[4].Warning	Holding Registers	1018	1018	1018	1	UINT	10			

Group	Symbol	Register Type	Address in DDI	Address in LPI	Address in LSI	Size	Data Type	Scaling	Bit	Bit-Function	Description
Sensor Trip/Warning	MB_Vib_Sensors[4].Trip	Holding Registers	1019	1019	1019	1	UINT	10			

9.1.2 OPC-UA: DDI/LPI/LSI Slave-Parameter

Group	Symbol	MODE	DDI	LPI	LSI	TYPE	Scaling	Bit	Bit-Function	Description
Status	Status_Word	read only	x	x	x	UINT16	Bitfield	0	Run	
								1	Rising_Water_Level	
								2	Falling_Water_Level	
								3	External_Off	
								4	Pump_Kick_Running	
								5	Anticlog_Running	
								6		
								7		
								8		
								9		
								10		
								11		
								12	Warning_TypeD_Active	only in LSI available
								13	Warning_TypeC_Active	only in LSI available
								14	Err_TypeB_Active	only in LSI available
								15	Err_TypeA_Active	only in LSI available
Status	Warning_Word_MSB	read only	x	x	x	UINT32	Bitfield	0	Comm_Error_Fieldbus_OPCUA	
								1	Thermostat_Mode_Limit_temperature	
								2	Clog_Detection	
								3	Vibration_X_warning	
								4	Vibration_Y_warning	
								5	Vibration_Z_warning	
								6	Vibration_1_warning	
								7	Vibration_2_warning	
Status	Warning_Word_LSB	read only	x	x	x	UINT32	Bitfield	0	High_Water_detected	
								1	Leackage_input	
								2	Temp_1_fault	
								3	Temp_2_fault	
								4	Temp_3_fault	
								5	Temp_4_fault	
								6	Temp_5_fault	
								7	Internal_Vibration_fault	
								8	Current_Input_1_fault	
								9	Current_Input_2_fault	
								10	Onboard_Temp_fault	
								11	Temp_1	
								12	Temp_2	
								13	Temp_3	
								14	Temp_4	
								15	Temp_5	
								16	Onboard_Temp	
								17	AMA_not_OK	
								18	General_FC	

Group	Symbol	MODE	DDI	LPI	LSI	TYPE	Scaling	Bit	Bit-Function	Description
								19	Motor_Ground_Fault	
								20	Motor_Overload	
								21	Motor_Overtemp	
								22	Motor_Short	
								23	Safe_Stop	
								24	FC_Overload	
								25	FC_Line	
								26	FC_DC_Circuit	
								27	FC_Supply	
								28	FC_Communication	
								29	Comm_Error_IO_Extension	
								30	Comm_Error_FC	
								31	Comm_Error_Fieldbus_Modbus_Slave	
Status	Alarm_Word_MSB	read only	x	x	x	UINT32	Bitfield			no content
Status	Alarm_Word_LSB	read only	x	x	x	UINT32	Bitfield	0	Motor_Ground_Fault	
								1	Motor_Short	
								2	Safe_Stop	
								3	Vibration_X_trip	
								4	Vibration_Y_trip	
								5	Vibration_Z_trip	
								6	Vibration_1_trip	
								7	Vibration_2_trip	
								8	FC_Overload	
								9	FC_Line	
								10	FC_DC_Circuit	
								11	FC_Supply	
								12	Dry_Run_detected	
								13	Leackage_input_alarm	
								14	Temp_Sensor_1_trip	
								15	Temp_Sensor_2_trip	
								16	Temp_Sensor_3_trip	
								17	Temp_Sensor_4_trip	
								18	Temp_Sensor_5_trip	
								19	Motor_Overload	
								20	Motor_Overtemp	
								21	General_FC	
								22	FC_Communication	
								23	AMA_Not_OK	
Motor Information	Serial_Number	read only	x	x	x	STRING256	-			
Motor Information	Motor Type	read only	x	x	x	STRING257	-			
Motor Information	Pump Type	read only	x	x	x	STRING258	-			
Motor Information	Nominal_Pwr	read only	x	x	x	FLOAT32 (High - Low)	-			
Motor Information	Nominal_Volt	read only	x	x	x	FLOAT32 (High - Low)	-			

Group	Symbol	MODE	DDI	LPI	LSI	TYPE	Scaling	Bit	Bit-Function	Description
Motor Information	Nominal_Curr	read only	x	x	x	FLOAT32 (High - Low)	-			
Motor Information	Nominal_Freq	read only	x	x	x	FLOAT32 (High - Low)	-			
Motor Information	Max_St_Per_Hour	read only	x	x	x	FLOAT32 (High - Low)	-			
Motor Information	Max_Freq	read only	x	x	x	FLOAT32 (High - Low)	-			
Motor Information	Min_Freq	read only	x	x	x	FLOAT32 (High - Low)	-			
Sensor Locations/Types	TempIn1Location	read only	x	x	x	UINT8	ENUM			0=unused / 1=winding_top / 2=winding_bottom / 3=bearing_top / 4=bearing_bottom / 5=cooling_liquid / 6=motor_laminations
Sensor Locations/Types	TempIn2Location	read only	x	x	x	UINT8	ENUM			0=unused / 1=winding_top / 2=winding_bottom / 3=bearing_top / 4=bearing_bottom / 5=cooling_liquid / 6=motor_laminations
Sensor Locations/Types	TempIn3Location	read only	x	x	x	UINT8	ENUM			0=unused / 1=winding_top / 2=winding_bottom / 3=bearing_top / 4=bearing_bottom / 5=cooling_liquid / 6=motor_laminations
Sensor Locations/Types	TempIn4Location	read only	x	x	x	UINT8	ENUM			0=unused / 1=winding_top / 2=winding_bottom / 3=bearing_top / 4=bearing_bottom / 5=cooling_liquid / 6=motor_laminations
Sensor Locations/Types	TempIn5Location	read only	x	x	x	UINT8	ENUM			0=unused / 1=winding_top / 2=winding_bottom / 3=bearing_top / 4=bearing_bottom / 5=cooling_liquid / 6=motor_laminations
Sensor Locations/Types	VibrationExtern1Location	read only	x	x	x	UINT8	ENUM			0=unused / 1=motor_hut_x / 2=motor_hut_y / 3=bearing_top_x / 4=bearing_ top_y / 5=bearing_bottom_x / 6=bearing_bottom_y
Sensor Locations/Types	VibrationExtern2Location	read only	x	x	x	UINT8	ENUM			0=unused / 1=motor_hut_x / 2=motor_hut_y / 3=bearing_top_x / 4=bearing_ top_y / 5=bearing_bottom_x / 6=bearing_bottom_y
Sensor Locations/Types	CurrentIn1Type	read only	x	x	x	UINT8	ENUM			0=unused / 1=current_signal_only / 2=leackage_ switch / 3=sealing_CLP_V01 / 4=leackage_CLP_V02
Sensor Locations/Types	CurrentIn2Type	read only	x	x	x	UINT8	ENUM			0=unused / 1=current_signal_only / 2=leackage_ switch / 3=sealing_CLP_V01 / 4=leackage_CLP_V03
Data Readouts	Temperature0	read only	x	x	x	FLOAT32 (High - Low)	-			
Data Readouts	Temperature1	read only	x	x	x	FLOAT32 (High - Low)	-			
Data Readouts	Tempreature2	read only	x	x	x	FLOAT32 (High - Low)	-			
Data Readouts	Temperature3	read only	x	x	x	FLOAT32 (High - Low)	-			
Data Readouts	Temperature4	read only	x	x	x	FLOAT32 (High - Low)	-			
Data Readouts	Temperature5	read only	x	x	x	FLOAT32 (High - Low)	-			
Data Readouts	Current0	read only	x	x	x	FLOAT32 (High - Low)	-			
Data Readouts	Current1	read only	x	x	x	FLOAT32 (High - Low)	-			
Data Readouts	Vibration0	read only	x	x	x	FLOAT32 (High - Low)	-			
Data Readouts	Vibration1	read only	x	x	x	FLOAT32 (High - Low)	-			
Data Readouts	Vibration2	read only	x	x	x	FLOAT32 (High - Low)	-			
Data Readouts	Vibration3	read only	x	x	x	FLOAT32 (High - Low)	-			
Data Readouts	Vibration4	read only	x	x	x	FLOAT32 (High - Low)	-			
Data Readouts	FC_power	read only	-	x	x	FLOAT32 (High - Low)	-			
Data Readouts	FC_Voltage	read only	-	x	x	FLOAT32 (High - Low)	-			
Data Readouts	FC_Current	read only	-	x	x	FLOAT32 (High - Low)	-			
Data Readouts	FC_Frequency	read only	-	x	x	FLOAT32 (High - Low)	-			
Data Readouts	Level	read only	x	x	x	FLOAT32 (High - Low)	-			
Data Readouts	Pressure	read only	x	x	x	FLOAT32 (High - Low)	-			
Data Readouts	Flow	read only	x	x	x	FLOAT32 (High - Low)	-			
Data Readouts	Running_Hours	read only	x	x	x	UINT64	1			

Group	Symbol	MODE	DDI	LPI	LSI	TYPE	Scaling	Bit	Bit-Function	Description
Data Readouts	Pump_Cycles	read only	x	x	x	UINT64	1			
Data Readouts	Cleaning_Cycles	read only	x	x	x	UINT64	1			
Data Readouts	Energy_Consumption	read only	-	x	x	UINT64	1			
Time	System_Current_Year	read only	x	x	x	UINT8	1			
Time	System_Current_Month	read only	x	x	x	UINT8	1			
Time	System_Current_Day	read only	x	x	x	UINT8	1			
Time	System_Current_Hour	read only	x	x	x	UINT8	1			
Time	System_Current_Minute	read only	x	x	x	UINT8	1			
Time	System_Current_Second	read only	x	x	x	UINT8	1			
Time	System_Uptime	read only	x	x	x	UINT32	1			
Time	System_Current_Ms	read only	x	x	x	UINT32	1			
Control Word	Control Word	read/write	x	x	x	UINT16	Bitfield	0	Reset	
								1	Start	Applies only for LPI
								2		
								3		
								4		
								5		
								6		
								7		
								8		
								9		
								10		
								11		
								12		
								13		
								14		
								15	Save_Config	Rising edge of this Bit is needed after changing a parameter of the group *Control Word* . This is not applicable for *Reset, Start and MB_Bus_Control_Value*
Control Word	Bus_Control_Value	read/write	-	x	x	UINT16	100			
Control Word	Operation_Mode	read/write	-	x	x	UINT8	ENUM			0=manual / 1=auto / 2=off
Control Word	Manual_Frequency	read/write	-	x	x	UINT16	100			
Control Word	FC_Ramp_Up_Time	read/write	-	x	x	UINT17	100			
Control Word	FC_Ramp_Down_Time	read/write	-	x	x	UINT18	100			
Control Word	Enable_Thermostat_Mode	read/write	-	x	x	UINT19	ENUM			0=off / 1=on
Control Word	Enable_Pump_Kick	read/write	-	x	x	UINT20	ENUM			0=off / 1=on
Control Word	Allow_Anticlog	read/write	-	x	x	UINT21	ENUM			0=off / 1=on
Sensor Trip/Warning	Temp_Sensors0_Warning	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Temp_Sensors0_Trip	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Temp_Sensors1_Warning	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Temp_Sensors1_Trip	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Temp_Sensors2_Warning	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Temp_Sensors2_Trip	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Temp_Sensors3_Warning	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Temp_Sensors3_Trip	read/write	x	x	x	UINT16	10			

Group	Symbol	MODE	DDI	LPI	LSI	TYPE	Scaling	Bit	Bit-Function	Description
Sensor Trip/Warning	Temp_Sensors4_Warning	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Temp_Sensors4_Trip	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Vib_Sensors0_Warning	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Vib_Sensors0_Trip	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Vib_Sensors1_Warning	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Vib_Sensors1_Trip	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Vib_Sensors2_Warning	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Vib_Sensors2_Trip	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Vib_Sensors3_Warning	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Vib_Sensors3_Trip	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Vib_Sensors4_Warning	read/write	x	x	x	UINT16	10			
Sensor Trip/Warning	Vib_Sensors4_Trip	read/write	x	x	x	UINT16	10			

9.1.3 ModBus TCP: LSI Master–Parameter

Group	Symbol	Register Type	Address in LSI	Size	Data Type	Scaling	Bit	Bit-Function	Description
System Variables	MB_Sys_Status_Word	Input Registers	10000	1	UINT	Bitfield	0	Run	
							1	Rising_Water_Level	
							2	Falling_Water_Level	
							3	External_Off	
							4		
							5	Anticlog_Running	
							6		
							7		
							8		
							9		
							10		
							11		
							12	Warning Type D is active	
							13	Warning Type C is active	
							14	Error Type B is active	
							15	Error Type A is actve	
System Variables	MS_Sys_Warning_Word_MSB	Input Registers	10001	2	DWORD (High - Low)	Bitfield		no content	
System Variables	MS_Sys_Warning_Word_LSB	Input Registers	10003	2	DWORD (High - Low)	Bitfield	0	Warning_In_Pump_1	
							1	Warning_In_Pump_2	
							2	Warning_In_Pump_3	
							3	Warning_In_Pump_4	
							4	Pipe_Sedimentation_High	
							5	IO_Extension_Comm_Err	
							6		
							7		
							8		
							9		
							10		
							11		
							12		
							13		
							14		
							15		
							16		
							17		
							18		
							19		
							20		
							21		
							22		
							23		
							24		
							25		
							26		
							27		

Group	Symbol	Register Type	Address in LSI	Size	Data Type	Scaling	Bit	Bit-Function	Description
							28		
							29		
							30		
							31		
System Variables	MS_Sys_Alarm_Word_MSB	Input Registers	10005	2	DWORD (High - Low)	Bitfield		no content	
System Variables	MS_Sys_Alarm_Word_LSB	Input Registers	10007	2	DWORD (High - Low)	Bitfield	0	Pump_Unit_Offline_1	
							1	Pump_Unit_Offline_2	
							2	Pump_Unit_Offline_3	
							3	Pump_Unit_Offline_4	
							4	Master_Switched_1	
							5	Master_Switched_2	
							6	Master_Switched_3	
							7	Master_Switched_4	
							8	Alarm_In_Pump_1	
							9	Alarm_In_Pump_2	
							10	Alarm_In_Pump_3	
							11	Alarm_In_Pump_4	
							12	Dry_Run	
							13	High_Water	
							14	Sensor_Error	
							15		
							16		
							17		
							18		
							19		
							20		
							21		
							22		
							23		
							24		
							25		
							26		
							27		
							28		
							29		
							30		
							31		
Analog Variables	IO_Level.Value	Input Registers	10009	2	FLOAT32 (High - Low)	-			
Analog Variables	IO_Pressure.Value	Input Registers	10011	2	FLOAT32 (High - Low)	-			
Analog Variables	IO_Flow.Value	Input Registers	10013	2	FLOAT32 (High - Low)	-			
Analog Variables	IO_Frequency	Input Registers	10015	2	FLOAT32 (High - Low)	-			
Analog Variables	SYS_No_Of_Pumps	Input Registers	10017	1	UINT	-			
Data Time Variables	RI_System_Current_Year	Input Registers	10018	1	UINT	-			
Data Time Variables	RI_System_Current_Month	Input Registers	10019	1	UINT	-			
Data Time Variables	RI_System_Current_Day	Input Registers	10020	1	UINT	-			

Group	Symbol	Register Type	Address in LSI	Size	Data Type	Scaling	Bit	Bit-Function	Description
Data Time Variables	RI_System_Current_Hour	Input Registers	10021	1	UINT	-			
Data Time Variables	RI_System_Current_Minute	Input Registers	10022	1	UINT	-			
Data Time Variables	RI_System_Current_Second	Input Registers	10023	1	UINT	-			
Data Time Variables	RI_System_Uptime	Input Registers	10024	2	DWORD (High - Low)	-			
Data Time Variables	RI_System_Current_Ms	Input Registers	10026	2	DWORD (High - Low)	-			
Pump 1	MSC_Infos[0].Serial_Number	Input Registers	11000	8	String(16)	-			
Pump 1	MSC_Infos[0].Motor_Type	Input Registers	11008	16	String(32)	-			
Pump 1	MSC_Infos[0].Pump_Type	Input Registers	11024	16	String(32)	-			
Pump 1	MSC_Infos[0].Status	Input Registers	11040	1	UINT	-			
Pump 1	MSC_Infos[0].Warning_MSB	Input Registers	11041	2	DWORD (High - Low)	-			
Pump 1	MSC_Infos[0].Warning_LSB	Input Registers	11043	2	DWORD (High - Low)	-			
Pump 1	MSC_Infos[0].Alarm_MSB	Input Registers	11045	2	DWORD (High - Low)	-			
Pump 1	MSC_Infos[0].Alarm_LSB	Input Registers	11047	2	DWORD (High - Low)	-			
Pump 1	MSC_Infos[0].FC_Power	Input Registers	11049	2	FLOAT32 (High - Low)	-			
Pump 1	MSC_Infos[0].Operation_Hours	Input Registers	11051	2	DWORD (High - Low)	-			
Pump 1	MSC_Infos[0].Number_Of_Start	Input Registers	11053	2	DWORD (High - Low)	-			
Pump 1	MSC_Infos[0].Number_Of_Cleaning	Input Registers	11055	2	DWORD (High - Low)	-			
Pump 1	MSC_Infos[0].Energy_Consumption	Input Registers	11057	2	FLOAT32 (High - Low)	-			
Pump 2	MSC_Infos[1].Serial_Number	Input Registers	12000	8	String(16)	-			
Pump 2	MSC_Infos[1].Motor_Type	Input Registers	12008	16	String(32)	-			
Pump 2	MSC_Infos[1].Pump_Type	Input Registers	12024	16	String(32)	-			
Pump 2	MSC_Infos[1].Status	Input Registers	12040	1	UINT	-			
Pump 2	MSC_Infos[1].Warning_MSB	Input Registers	12041	2	DWORD (High - Low)	-			
Pump 2	MSC_Infos[1].Warning_LSB	Input Registers	12043	2	DWORD (High - Low)	-			
Pump 2	MSC_Infos[1].Alarm_MSB	Input Registers	12045	2	DWORD (High - Low)	-			
Pump 2	MSC_Infos[1].Alarm_LSB	Input Registers	12047	2	DWORD (High - Low)	-			
Pump 2	MSC_Infos[1].FC_Power	Input Registers	12049	2	FLOAT32 (High - Low)	-			
Pump 2	MSC_Infos[1].Operation_Hours	Input Registers	12051	2	DWORD (High - Low)	-			
Pump 2	MSC_Infos[1].Number_Of_Start	Input Registers	12053	2	DWORD (High - Low)	-			
Pump 2	MSC_Infos[1].Number_Of_Cleaning	Input Registers	12055	2	DWORD (High - Low)	-			
Pump 2	MSC_Infos[1].Energy_Consumption	Input Registers	12057	2	FLOAT32 (High - Low)	-			
Pump 3	MSC_Infos[2].Serial_Number	Input Registers	13000	8	String(16)	-			
Pump 3	MSC_Infos[2].Motor_Type	Input Registers	13008	16	String(32)	-			
Pump 3	MSC_Infos[2].Pump_Type	Input Registers	13024	16	String(32)	-			
Pump 3	MSC_Infos[2].Status	Input Registers	13040	1	UINT	-			
Pump 3	MSC_Infos[2].Warning_MSB	Input Registers	13041	2	DWORD (High - Low)	-			
Pump 3	MSC_Infos[2].Warning_LSB	Input Registers	13043	2	DWORD (High - Low)	-			
Pump 3	MSC_Infos[2].Alarm_MSB	Input Registers	13045	2	DWORD (High - Low)	-			
Pump 3	MSC_Infos[2].Alarm_LSB	Input Registers	13047	2	DWORD (High - Low)	-			
Pump 3	MSC_Infos[2].FC_Power	Input Registers	13049	2	FLOAT32 (High - Low)	-			
Pump 3	MSC_Infos[2].Operation_Hours	Input Registers	13051	2	DWORD (High - Low)	-			
Pump 3	MSC_Infos[2].Number_Of_Start	Input Registers	13053	2	DWORD (High - Low)	-			
Pump 3	MSC_Infos[2].Number_Of_Cleaning	Input Registers	13055	2	DWORD (High - Low)	-			
Pump 3	MSC_Infos[2].Energy_Consumption	Input Registers	13057	2	FLOAT32 (High - Low)	-			
Pump 4	MSC_Infos[3].Serial_Number	Input Registers	14100	8	String(16)	-			

Group	Symbol	Register Type	Address in LSI	Size	Data Type	Scaling	Bit	Bit-Function	Description
Pump 4	MSC_Infos[3].Motor_Type	Input Registers	14108	16	String(32)	-			
Pump 4	MSC_Infos[3].Pump_Type	Input Registers	14124	16	String(32)	-			
Pump 4	MSC_Infos[3].Status	Input Registers	14140	1	UINT	-			
Pump 4	MSC_Infos[3].Warning_MSB	Input Registers	14141	2	DWORD (High - Low)	-			
Pump 4	MSC_Infos[3].Warning_LSB	Input Registers	14143	2	DWORD (High - Low)	-			
Pump 4	MSC_Infos[3].Alarm_MSB	Input Registers	14145	2	DWORD (High - Low)	-			
Pump 4	MSC_Infos[3].Alarm_LSB	Input Registers	14147	2	DWORD (High - Low)	-			
Pump 4	MSC_Infos[3].FC_Power	Input Registers	14149	2	FLOAT32 (High - Low)	-			
Pump 4	MSC_Infos[3].Operation_Hours	Input Registers	14151	2	DWORD (High - Low)	-			
Pump 4	MSC_Infos[3].Number_Of_Start	Input Registers	14153	2	DWORD (High - Low)	-			
Pump 4	MSC_Infos[3].Number_Of_Cleaning	Input Registers	14155	2	DWORD (High - Low)	-			
Pump 4	MSC_Infos[3].Energy_Consumption	Input Registers	14157	2	FLOAT32 (High - Low)	-			
Control Word	MB_Sys_Control_Word	Holding Registers	10000	1	UINT	Bitfield	0	Reset	Reset errors on a rising edge of this bit
							1	PID_Controller_Bus_Enable	Activation of PID controller
							2	Trigger_Start_Level	Start emptying the pump sump
							3	Alternative_Start_Level	Activates the alternative start level configured via web interface
							4		
							5		
							6		
							7		
							8		
							9		
							10		
							11		
							12		
							13		
							14		
							15	Save_Config	Rising edge of this Bit is needed after changing a parameter of the group *Control Word* or group *Modes* . This is not applicable for *Reset* .
Modes	MB_Sys_Operating_Mode	Holding Registers	10001	1	UINT	ENUM			0=off /1=on
Modes	MB_Sys_Auto_Mode_Selection	Holding Registers	10002	1	UINT	ENUM			0=Level Control / 1=PID Controller / 2=High Efficiency Controller
PID Setpoint	MB_Sys_PID_Setpoint	Holding Registers	10200	1	UINT	100			Setpoint in % of scale multiplied by 100 (0 = 0%, 10000 = 100%)

9.1.4 OPC-UA: LSI Master-Parameter

Group	Symbol	MODE	TYPE	Scaling	Bit	Bit-Function	Description
System Variables	Sys_Status_Word	read only	UINT16	Bitfield	0	Run	
					1	Rising_Water_Level	
					2	Falling_Water_Level	
					3	External_Off	
					4		
					5	Anticlog_Running	
					6		
					7		
					8		
					9		
					10		
					11		
					12	Warning Type D is active	
					13	Warning Type C is active	
					14	Error Type B is active	
					15	Error Type A is active	
System Variables	Sys_Warning_Word_MSB	read only	UINT32	Bitfield		no content	
System Variables	Sys_Warning_Word_LSB	read only	UINT32	Bitfield	0	Warning_In_Pump_1	
					1	Warning_In_Pump_2	
					2	Warning_In_Pump_3	
					3	Warning_In_Pump_4	
					4	Pipe_Sedimentation_High	
					5	IO_Extension_Comm_Err	
					6		
					7		
					8		
					9		
					10		
					11		
					12		
					13		
					14		
					15		
					16		
					17		
					18		

Group	Symbol	MODE	TYPE	Scaling	Bit	Bit-Function	Description
					19		
					20		
					21		
					22		
					23		
					24		
					25		
					26		
					27		
					28		
					29		
					30		
					31		
System Variables	Sys_Alarm_Word_MSB	read only	UINT32	Bitfield		no content	
System Variables	Sys_Alarm_Word_LSB	read only	UINT32	Bitfield	0	Pump_Unit_Offline_1	
					1	Pump_Unit_Offline_2	
					2	Pump_Unit_Offline_3	
					3	Pump_Unit_Offline_4	
					4	Master_Switched_1	
					5	Master_Switched_2	
					6	Master_Switched_3	
					7	Master_Switched_4	
					8	Alarm_In_Pump_1	
					9	Alarm_In_Pump_2	
					10	Alarm_In_Pump_3	
					11	Alarm_In_Pump_4	
					12	Dry_Run	
					13	High_Water	
					14	Sensor_Error	
					15		
					16		
					17		
					18		
					19		
					20		
					21		

Group	Symbol	MODE	TYPE	Scaling	Bit	Bit-Function	Description
					22		
					23		
					24		
					25		
					26		
					27		
					28		
					29		
					30		
					31		
Analog Variables	Level.Value	read only	FLOAT32 (High - Low)	-			
Analog Variables	Pressure.Value	read only	FLOAT32 (High - Low)	-			
Analog Variables	Flow.Value	read only	FLOAT32 (High - Low)	-			
Analog Variables	Frequency.Value	read only	FLOAT32 (High - Low)	-			
Analog Variables	No_Of_Pumps	read only	UINT8	-			
Data Time Variables	System_Current_Year	read only	UINT8	-			
Data Time Variables	System_Current_Month	read only	UINT8	-			
Data Time Variables	System_Current_Day	read only	UINT8	-			
Data Time Variables	System_Current_Hour	read only	UINT8	-			
Data Time Variables	System_Current_Minute	read only	UINT8	-			
Data Time Variables	System_Current_Second	read only	UINT8	-			
Data Time Variables	System_Uptime	read only	UINT32	-			
Data Time Variables	System_Current_Ms	read only	UINT32	-			
Pump1	Master0_Serial_Number	read only	STRING256	-			
Pump1	Master0_Motor_Type	read only	STRING256	-			
Pump1	Master0_Pump_Type	read only	STRING256	-			
Pump1	Master0_Status	read only	UINT16	-			
Pump1	Master0_Warning_MSB	read only	UINT32	-			
Pump1	Master0_Warning_LSB	read only	UINT32	-			
Pump1	Master0_Alarm_MSB	read only	UINT32	-			
Pump1	Master0_Alarm_LSB	read only	UINT32	-			
Pump1	Master0_FC_Power	read only	FLOAT32 (High - Low)	-			
Pump1	Master0_Operating_Hours	read only	UINT32	-			
Pump1	Master0_Number_Of_Start	read only	UINT32	-			
Pump1	Master0_Number_Of_Cleaning	read only	UINT32	-			
Pump1	Master0_Energy_Consumption	read only	FLOAT32 (High - Low)	-			

Group	Symbol	MODE	TYPE	Scaling	Bit	Bit-Function	Description
Pump2	Master1_Serial_Number	read only	STRING256	-			
Pump2	Master1_Motor_Type	read only	STRING256	-			
Pump2	Master1_Pump_Type	read only	STRING256	-			
Pump2	Master1_Status	read only	UINT16	-			
Pump2	Master1_Warning_MSB	read only	UINT32	-			
Pump2	Master1_Warning_LSB	read only	UINT32	-			
Pump2	Master1_Alarm_MSB	read only	UINT32	-			
Pump2	Master1_Alarm_LSB	read only	UINT32	-			
Pump2	Master1_FC_Power	read only	FLOAT32 (High - Low)	-			
Pump2	Master1_Operating_Hours	read only	UINT32	-			
Pump2	Master1_Number_Of_Start	read only	UINT32	-			
Pump2	Master1_Number_Of_Cleaning	read only	UINT32	-			
Pump2	Master1_Energy_Consumption	read only	FLOAT32 (High - Low)	-			
Pump3	Master2_Serial_Number	read only	STRING256	-			
Pump3	Master2_Motor_Type	read only	STRING256	-			
Pump3	Master2_Pump_Type	read only	STRING256	-			
Pump3	Master2_Status	read only	UINT16	-			
Pump3	Master2_Warning_MSB	read only	UINT32	-			
Pump3	Master2_Warning_LSB	read only	UINT32	-			
Pump3	Master2_Alarm_MSB	read only	UINT32	-			
Pump3	Master2_Alarm_LSB	read only	UINT32	-			
Pump3	Master2_FC_Power	read only	FLOAT32 (High - Low)	-			
Pump3	Master2_Operating_Hours	read only	UINT32	-			
Pump3	Master2_Number_Of_Start	read only	UINT32	-			
Pump3	Master2_Number_Of_Cleaning	read only	UINT32	-			
Pump3	Master2_Energy_Consumption	read only	FLOAT32 (High - Low)	-			
Pump4	Master3_Serial_Number	read only	STRING256	-			
Pump4	Master3_Motor_Type	read only	STRING256	-			
Pump4	Master3_Pump_Type	read only	STRING256	-			
Pump4	Master3_Status	read only	UINT16	-			
Pump4	Master3_Warning_MSB	read only	UINT32	-			
Pump4	Master3_Warning_LSB	read only	UINT32	-			
Pump4	Master3_Alarm_MSB	read only	UINT32	-			
Pump4	Master3_Alarm_LSB	read only	UINT32	-			
Pump4	Master3_FC_Power	read only	FLOAT32 (High - Low)	-			
Pump4	Master3_Operating_Hours	read only	UINT32	-			

Group	Symbol	MODE	TYPE	Scaling	Bit	Bit-Function	Description
Pump4	Master3_Number_Of_Start	read only	UINT32	-			
Pump4	Master3_Number_Of_Cleaning	read only	UINT32	-			
Pump4	Master3_Energy_Consumption	read only	FLOAT32 (High - Low)	-			
Control Word	Sys_Control_Word	read/write	UINT16	Bitfield	0	Reset	Reset errors on a rising edge of this bit
					1	PID_Controller_Bus_Enable	Activation of PID controller
					2	Trigger_Start_Level	Start emptying the pump sump
					3	Alternative_Start_Level	Activates the alternative start level configured via web interface
					4		
					5		
					6		
					7		
					8		
					9		
					10		
					11		
					12		
					13		
					14		
					15	Save_Config	Save configuration
Modes	Sys_Operating_Mode	read/write	UINT8	ENUM			0=off /1=on
Modes	Sys_Auto_Mode_Selection	read/write	UINT8	ENUM			0=Level Control / 1=PID Controller / 2=High Efficiency Controller
PID Setpoint	Sys_PID_Setpoint.Variable	read/write	UINT16	100			Setpoint in % of scale multiplied by 100 (0 = 0%, 10000 = 100%)

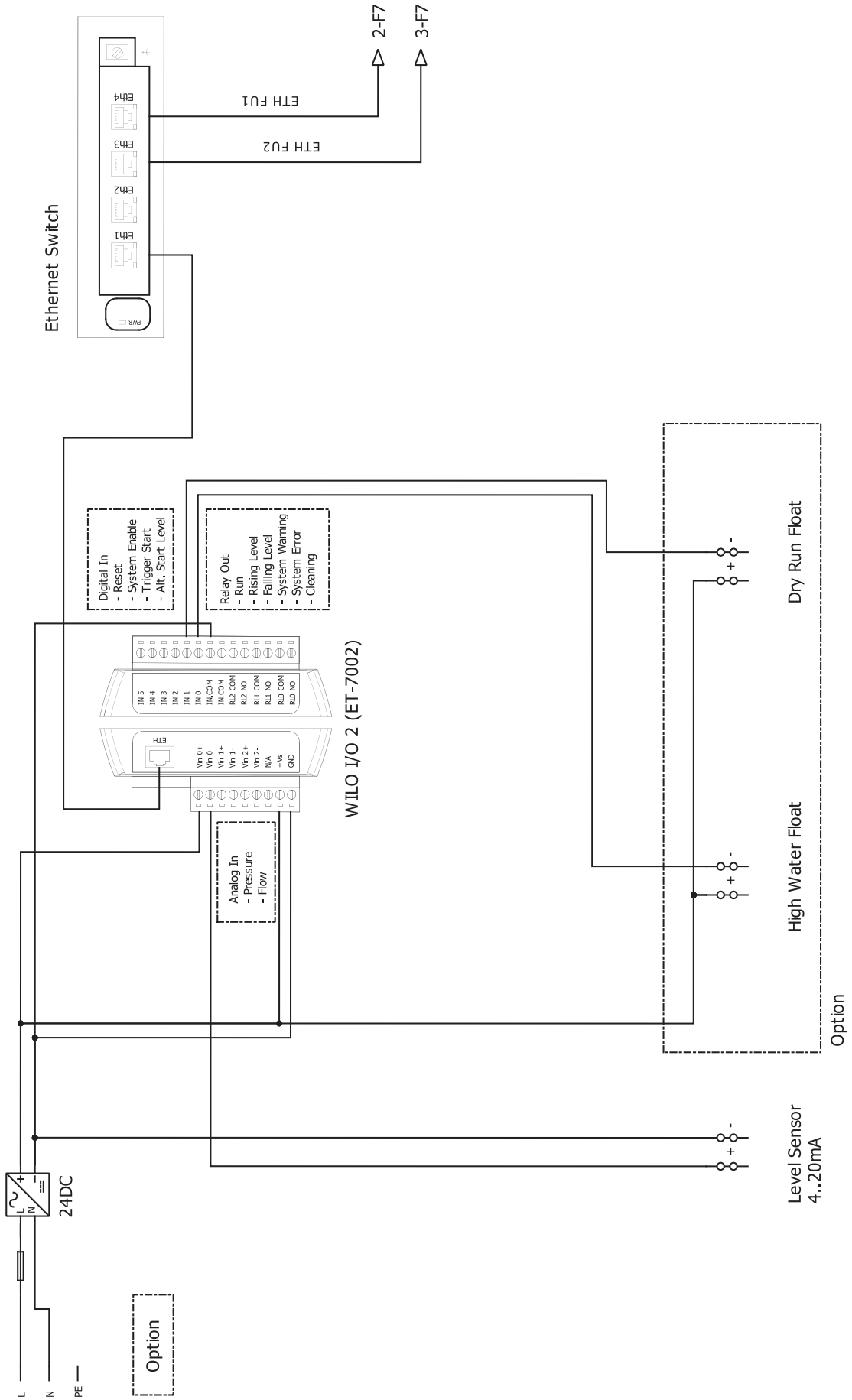
9.2 Example circuit diagrams for LSI system mode

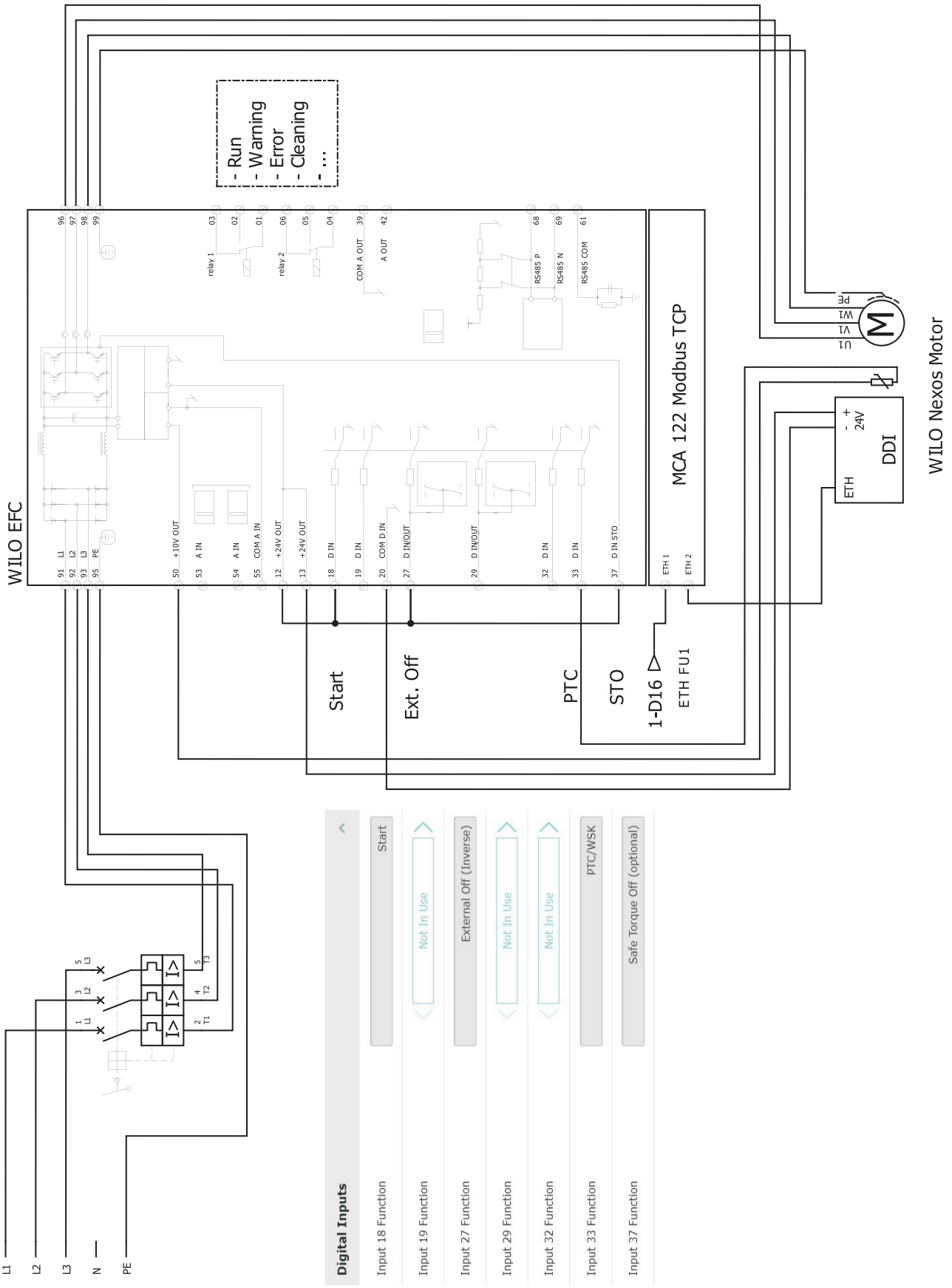
NOTICE! The following circuit diagrams refer to a pumping station with two pumps. The circuit diagrams for the connection of the frequency converter and the pump also apply to pump 3 and 4 of a pumping station.

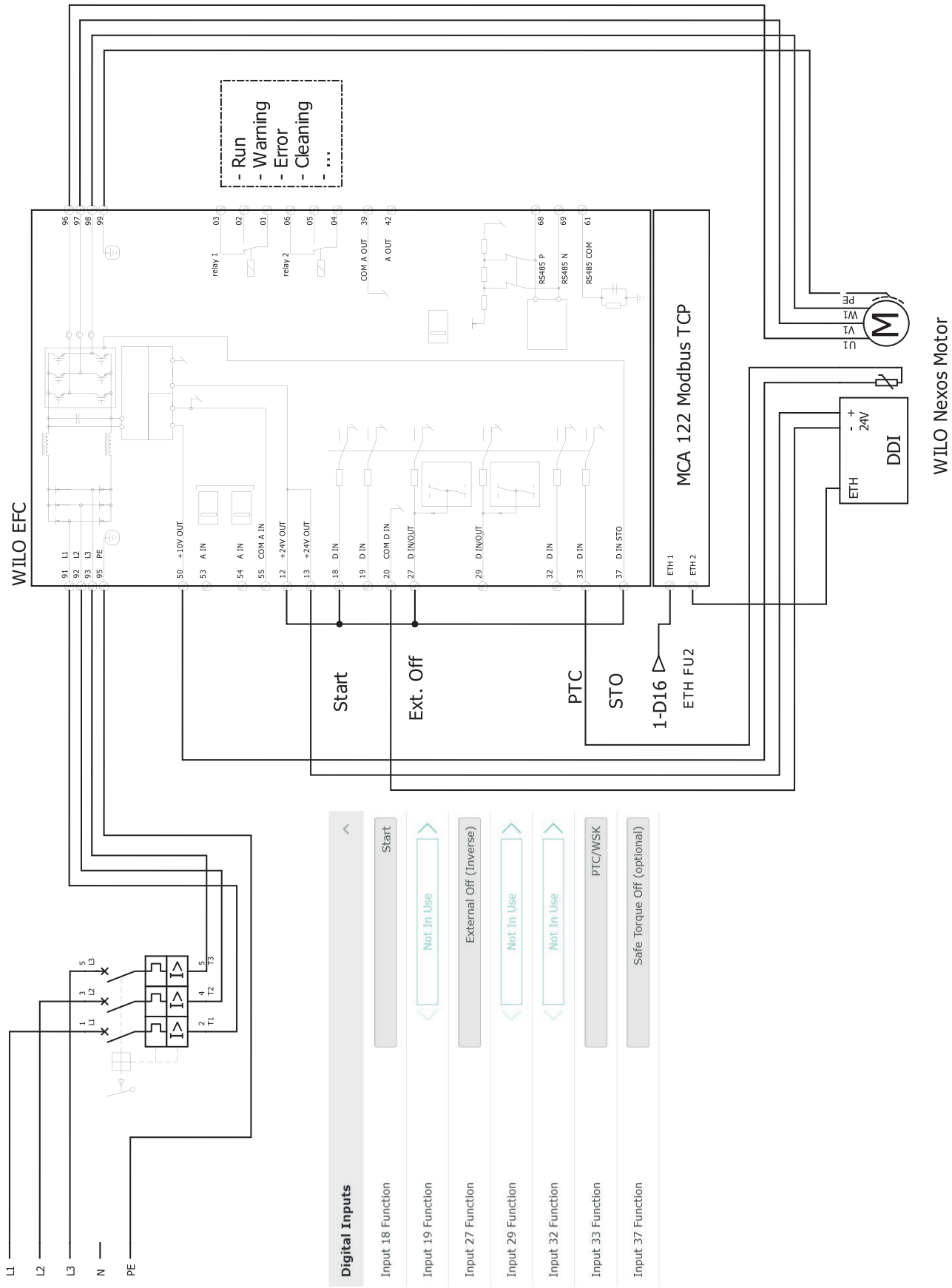
See also

- LSI System mode: connection example without Ex [▶ 188]
- LSI System mode: connection example with Ex [▶ 191]

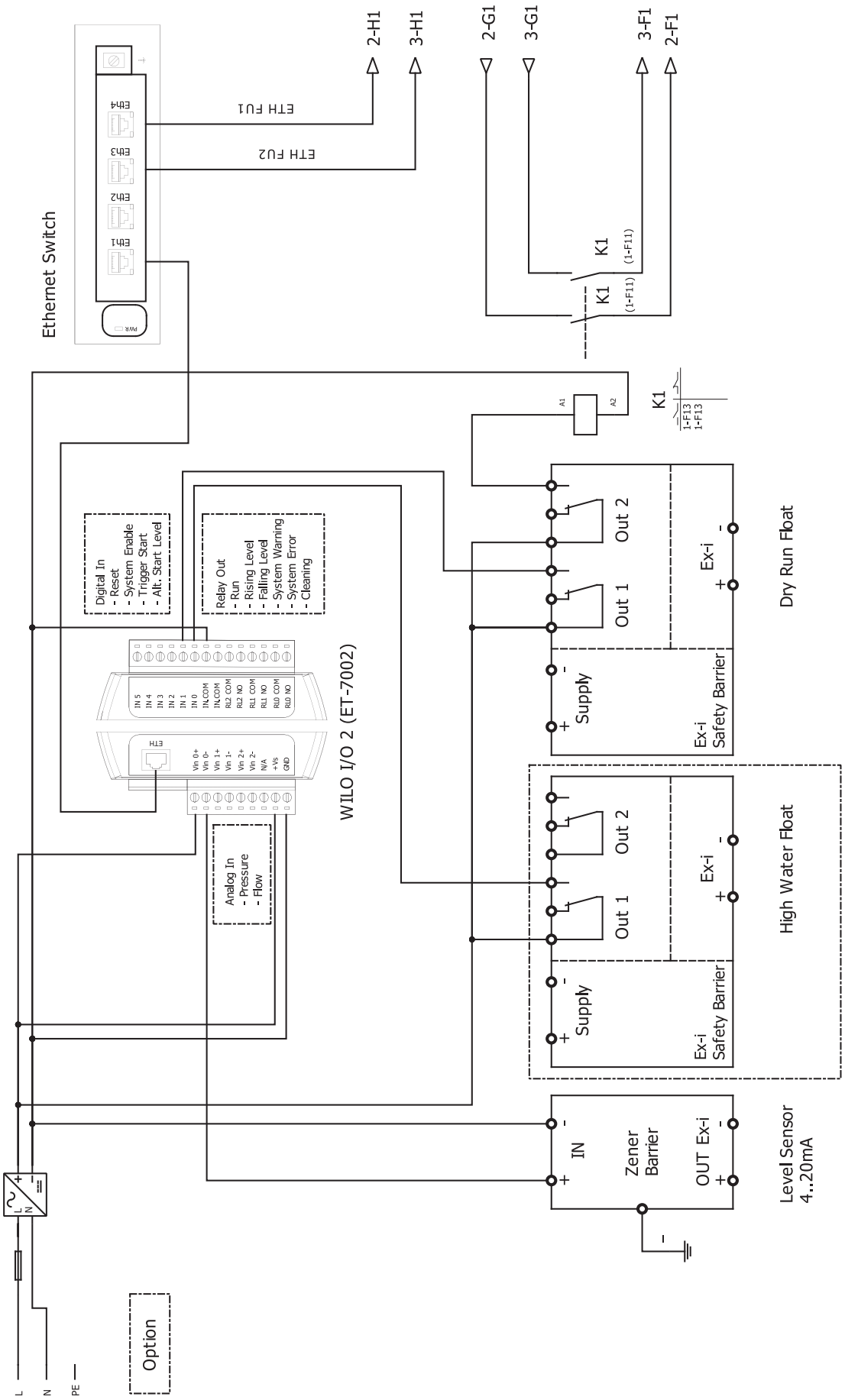
9.2.1 LSI System mode: connection example without Ex

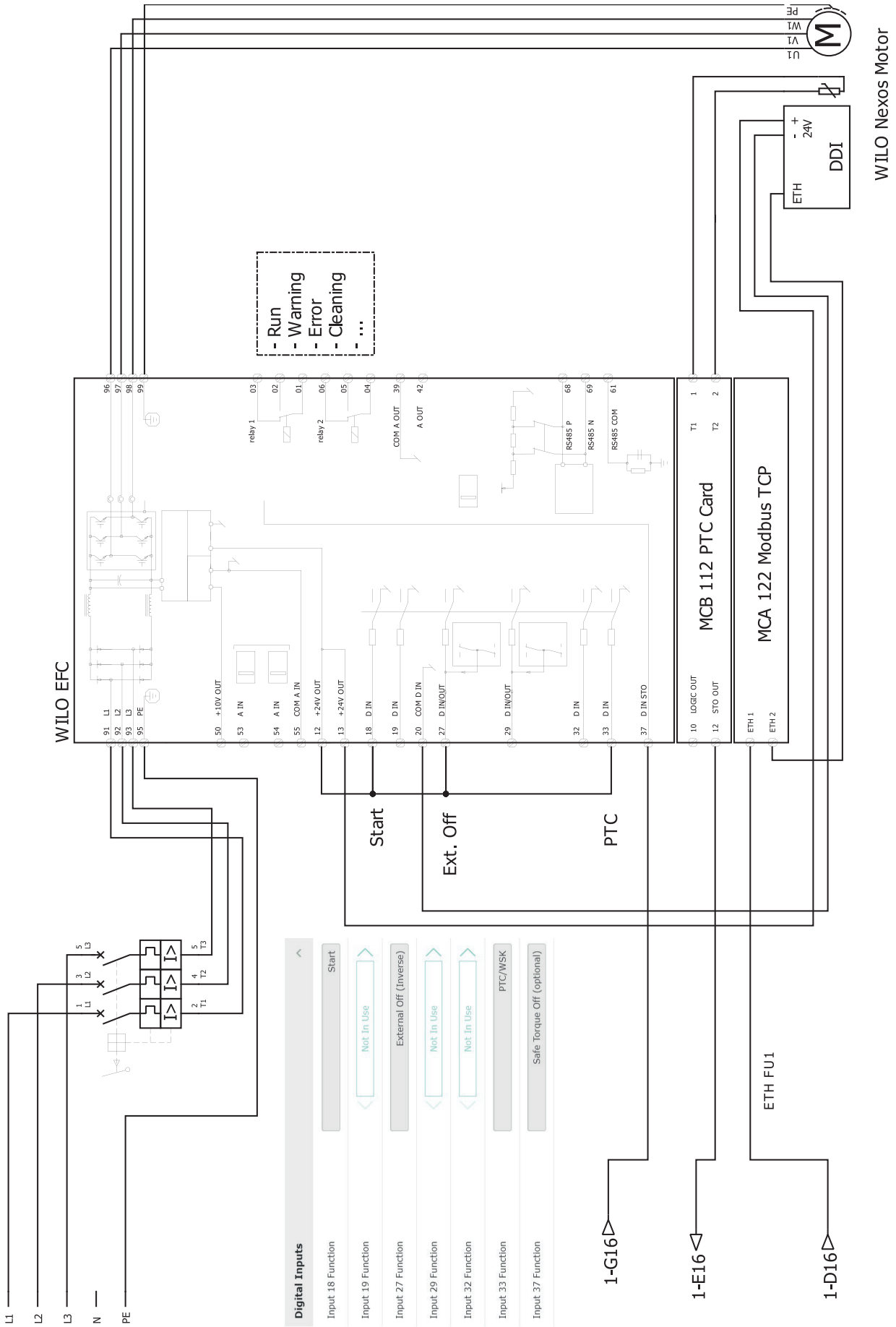


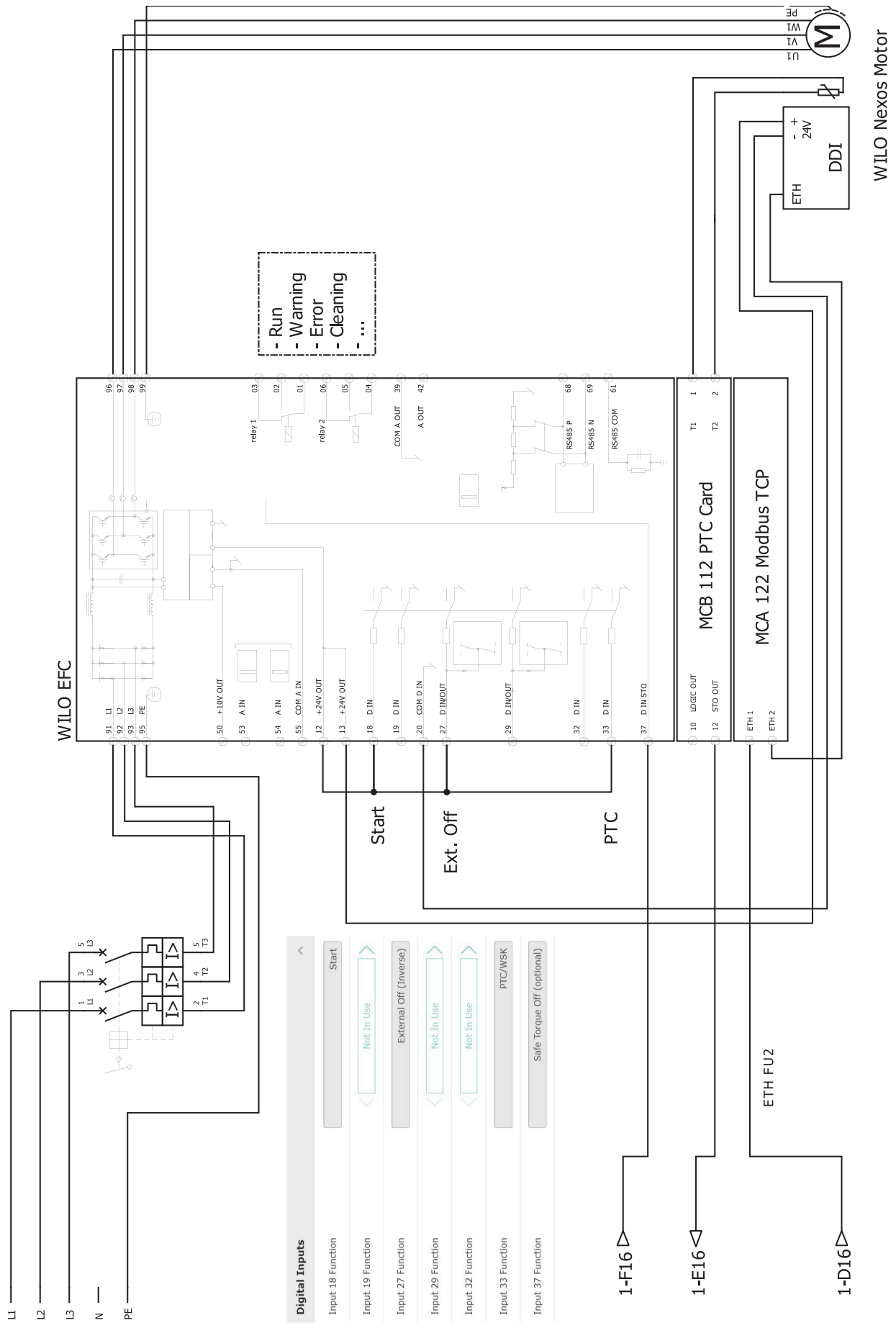

WILO EFC
MCA 122 Modbus TCP
WILO Nexos Motor
- Run
- Warning
- Error
- Cleaning
- ...
relay 1
relay 2
COM A OUT
A OUT
RS485 P
RS485 N
RS485 COM
+10V OUT
A IN
COM A IN
+24V OUT
D IN
COM D IN
D IN/OUT
ETH 1
ETH 2
ETH
DDI
24V
Start
Ext. Off
PTC
STO
1-D16
ETH FU1
L1
L2
L3
N
PE
Digital Inputs
Input 18 Function
Input 19 Function
Input 27 Function
Input 29 Function
Input 32 Function
Input 33 Function
Input 37 Function
Start
Not In Use
External Off (Inverse)
Not In Use
Not In Use
PTC/WSK
Safe Torque Off (optional)


- Run
- Warning
- Error
- Cleaning
- ...
WILO EFC
MCA 122 Modbus TCP
WILO Nexos Motor
DDI
ETH
- +
24V
Start
Ext. Off
PTC
STO
1-D16
ETH FU2
L1
L2
L3
N
PE
Digital Inputs
Input 18 Function
Input 19 Function
Input 27 Function
Input 29 Function
Input 32 Function
Input 33 Function
Input 37 Function
Start
Not In Use
External Off (Inverse)
Not In Use
Not In Use
PTC/WSK
Safe Torque Off (optional)

9.2.2 LSI System mode: connection example with Ex




WILO Nexos Motor
U1
V1
W1
PE
DDI
ETH
24V
- Run
- Warning
- Error
- Cleaning
- ...
WILO EFC
MCB 112 PTC Card
MCA 122 Modbus TCP
relay 1
relay 2
COM A OUT
A OUT
RS485 P
RS485 N
RS485 COM
+10V OUT
A IN
COM A IN
+24V OUT
D IN
COM D IN
D IN/OUT
LOGIC OUT
STO OUT
ETH 1
ETH 2
Start
Ext. Off
PTC
ETH FU1
1-G16
1-E16
1-D16
L1
L2
L3
N
PE
Digital Inputs
Input 18 Function
Input 19 Function
Input 27 Function
Input 29 Function
Input 32 Function
Input 33 Function
Input 37 Function
Start
Not In Use
External Off (Inverse)
Not In Use
Not In Use
PTC/WSK
Safe Torque Off (optional)


WILO Nexos Motor
U1
V1
W1
PE
M
DDI
ETH
- +
24V
- Run
- Warning
- Error
- Cleaning
- ...
WILO EFC
MCB 112 PTC Card
MCA 122 Modbus TCP
relay 1
relay 2
COM A OUT
A OUT
RS485 P
RS485 N
RS485 COM
+10V OUT
A IN
COM A IN
+24V OUT
D IN
COM D IN
D IN/OUT
STO OUT
LOGIC OUT
ETH 1
ETH 2
Start
Ext. Off
PTC
ETH FU2
1-F16
1-E16
1-D16
L1
L2
L3
N
PE
Digital Inputs
Input 18 Function
Input 19 Function
Input 27 Function
Input 29 Function
Input 32 Function
Input 33 Function
Input 37 Function
Start
Not In Use
External Off (Inverse)
Not In Use
Not In Use
PTC/WSK
Safe Torque Off (optional)

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