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## Requirements for the Installation and Integration of the Aqualogic® Controller System

Aqualogic® communicates via an OPC interface with an existing programmable logic controller or another OPC communication partner such as an existing process control/SCADA system. The OPC server can be, for example, the dataFEED OPC DA server from Softing or another OPC server of an existing process control system that supports OPC DA. Aqualogic® is operated as a client and in this function requires both read and write access to data from the communication partner.

The Aqualogic® controller software can be installed on an existing PC or on a separate PC. The PC can be purchased from Passavant-Geiger if required.

### General PC properties

Recommended equipment for the industrial process computer on which Aqualogic® is to be installed:

- Operating system Windows 10 and higher
- CPU Intel® i5 7200U
- 8 GB RAM
- At least 240GB hard disk space
- Graphics resolution at least 1280 x 960 pixels
- 2 x LAN type Intel 10/100/1000
- 2 x USB 2.0

An uninterruptible power supply (UPS) is recommended to protect the PC. Aqualogic® can also be installed on a Windows server or a virtual machine.

### Communication interface

Various measured values are required by Aqualogic® to calculate the control phases and the aeration intensity. The standard controller expects oxygen, ammonium, nitrate and temperature as input values, and redox potential if necessary. Depending on the controller variant or selection of the additional modules, further measured values such as the phosphate concentration, the feed quantity, the dry matter content, etc. may be required. The specific selection of the measured values used for control must be checked individually for each implementation case.

For aeration, Aqualogic® supplies the calculated air flow rate in the range [0...100] % measured against the total air flow rate of all blowers as the control value. The PLC uses this setpoint to control the connected fans. The PLC converts the percentage value into specific unit control values.

Depending on the module, Aqualogic® can also supply "Dosing pump output", "Valve opening degree", etc. in intervals of 0 - 100 %.

To monitor the communication between the PLC and Aqualogic®, two counters are used, which react accordingly when they stop.

The Aqualogic® controller sends a live signal to the PLC. The live signal is a counter that changes at a predefined time cycle and indicates that Aqualogic® is active. If the live signal no longer changes, the communication partner (the PLC) takes over the oxygen control and starts an emergency program (see below).

The SPSWatchDog is used to ensure that communication from the PLC to Aqualogic® is functioning properly. If this signal does not change for a certain (definable) period of time, Aqualogic® reestablishes the connection to the PLC.

Depending on the expansion stage, further control values can be specified, e.g. for the dosing of precipitants or process water. In principle, Aqualogic® also specifies setpoints as percentage values in the range of [0...100] %; the PLC is responsible for converting the setpoint to existing units.

The technical specifications for data exchange between Aqualogic® and various communication partners are listed below as examples for two options. Siemens controllers are predominantly used. Communication with other programmable logic controllers (Mitsubishi, Schneider, ABB, etc.) must be checked in advance on a case-by-case basis:

### Example SIEMENS PLC (other PLC providers possible)

<p><b>Coupling via Ethernet / Profinet</b></p> <p>Data is exchanged with the S7 via TCP/IP.</p> <p>Requirements Aqualogic®:</p> <ul style="list-style-type: none"> <li>• dataFeed OPC-DA-Server</li> <li>• LAN card</li> </ul>	<p><b>Coupling via Profibus</b></p> <p>Data is exchanged with the S7 via Profibus DP.</p> <p>Aqualogic® requirements:</p> <ul style="list-style-type: none"> <li>• APPLICOM OPC server</li> <li>• APPLICOM Profibus card DRL-DPM-PCI</li> <li>• Corresponding communication processor Profibus cable to the Aqualogic® PC</li> </ul>
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## Example process control system (PCS) (other PCS providers possible)

### *a) Process control system (DCS) FlowChief*

Coupling via OPC server DataFeed

Data exchange with the S7 takes place via TCP/IP

Requirements Aqualogic®:

- dataFEED OPC-DA server
- LAN card

### *b) Process control system (DCS) BITControl AquaProvi*

Coupling via Aqua Provi's own OPC server

### *c) Process control system (DCS) AQASYS (Schraml)*

Coupling via own OPC server from AQASYS

## Emergency program

In the event of a connection failure or if Aqualogic® detects a lack of oxygen, an emergency program is started that is installed on the PLC or controlled by the communication partner (e.g. process control system). The emergency program can consist of a time pause control, e.g. aerate for 1 hour at 80 %, run for 45 minutes without aeration. However, an old control system replaced by Aqualogic® can also be reactivated. The emergency program is basically optional and the responsibility of the operator. However, it is strongly recommended that it is implemented. The implementation of the emergency program and the switchover to the emergency program must be carried out on site by the supplier of the PLC.

## Alarming

In the event of a fault, the telephone call sends e-mail and SMS notifications via HTML commands. External live monitoring of the Aqualogic® program also takes place, so that the user receives an SMS notification if the Aqualogic® PC is no longer active, e.g. due to a power failure or a computer defect, or can no longer send any messages itself, e.g. due to a DSL failure. Permanent Internet access is required to use the Teleruf module.

## SBR mode

In SBR mode, the Aqualogic® control system is only active in certain treatment phases. To coordinate this, a variable is provided in the PLC via which Aqualogic® is activated or deactivated accordingly by the PLC. This variable is set to 0 to deactivate Aqualogic® in the set-down or removal phase, for example, and to transfer control to the Aqualogic® controller in the filling and treatment phase, for example, this variable is set to 1. The implementation and process-compliant generation of the activation signal must be provided by the PLC supplier.

## Alternating operation

In alternating operation, two aeration tanks or aeration lines are aerated alternately in order to avoid maximum power consumption and current peaks, among other things. For this mode of operation, for example, two controllers are synchronized via a communication variable in the PLC. A leading controller activates or deactivates the control mode of another controller. If the communication variable for the synchronization of controller1 is set to 1 (e.g. if controller1 is in the unventilated phase), controller2 switches to control mode; if the variable is set to 0 (e.g. if controller1 is in the ventilated phase), controller2 switches to unventilated mode. This also achieves uniform and continuous fan runtimes.

If alternating operation is implemented with Aqualogic® , the PLC must monitor whether the leading controller is active. This is done via the live signal (see above). If the live signal is lost, the dependent controller must be set to control mode by the PLC by setting the synchronization variable.

## Remote maintenance

Remote maintenance software (currently TeamViewer as standard) is usually used for optimum customer service and to ensure optimum support for the controller installation, particularly during the initial phase. With its help, Aqualogic® Service can dial directly into the PC installed on the wastewater treatment plant to support the plant personnel or to analyze data. An Internet connection to the PC is required for this remote maintenance. The TeamViewer remote maintenance software can be supplied by Passavant-Geiger on request. The required DSL connection must be provided by the customer.

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The technical data stated in this brochure are indicative only and have to be determined for each individual case.  
Reserve technical changes.