Test Project

Task D3 – Automation in water and wastewater treatment plant

EDS water management system wastewater treatment station – 2 hours

Water Technology

Submitted by:

Thomas Schwab - ADIRO Automatisierungstechnik Gmb, Independent Test Project Designer
Liu Qishan - Singapore Polytechnic, Independent Test Project Designer

Hamza Lekhbizi - H+E GmbH, Independent Test Project Validator

Contents

Introduction to Test Project **3**
Description of project and tasks **3**
Instructions to the Competitor **4**
Index of Figure **9**
Task Forms **22**
Marking Scheme **22**

© WorldSkills International

Introduction to Test Project

The EDS for Water Management simulates the core processes of water treatment, supply and sewage treatment. The circulation of water from the initial source, transport and treatment of wastewater is simulated.

The station represents the biological treatment process of wastewater treatment. It includes an aeration tank and a secondary settlement tank. Plastic granules are used to simulate the pollutant load. These granules can be air-dried and reused after utilization. A water supply tank with a submersible pump is required for operation.

The station teaches the principles, functions, and processes of a wastewater treatment station.

You will be provided with the following main components for the task.

- Wastewater treatment station
- Water supply tank/ground water
- Tools required for this task
- Watering can
- Extension Kit EDS WMGT WorldSkills 2026 Shanghai
- EasyPort USB
- Analog cable, SysLink I/O data cable
- Tabletop power supply unit
- PC with FluidLab Water Management

Note: A range of sensors and actuators is provided. Use only the components required to fulfill this task.

Description of project and tasks

Your task is to change the existing treatment process of the wastewater treatment station into a SBR (Sequencing Batch Reactor) process. This modification is intended to clearly illustrate the differences between the treatment steps and to familiarize new employees with the operating principle of an SBR process.

The engineering team has prepared the technical documentation, including Piping and Instrumentation Diagrams (P&IDs), drawings, and simplified instructions for connecting electrical components. Your task involves building, testing, and documenting the results of this system.

Your task:

1. Preparation: Use the standard EDS WMGT Station - Wastewater treatment station and optimize it for the task.
2. Modify and assemble the station using the information provided.
3. Set up the station.
4. Test the station and document the results according to the test protocol.

© WorldSkills International

Instructions to the Competitor

1. Preparation: Use the standard EDS WMGT Station - Wastewater treatment and optimize it.

Note for all tasks:
Do not use the pipes from, or make changes to, the right-hand secondary clarification. Use as less new pipes and as little water as possible. Do not cut the electrical cables for the sensors and actuators so they can be used for other tasks. Place all unused equipment neatly into the box of the "Extension Kit EDS WMGT WorldSkills 2026 Shanghai". Do not damage the cardboard boxes provided.

Follow the guide and best practices for all steps, including cable routing and the use of cable holders.

2. Assemble the station mechanically using the information provided.

- Remove the pipe section (Figure 1) and its tank connector.

Note: Do not reuse these components for the new pipe system. Leave the pipe on the System for quick reassembly of the station.

- P&ID of the new station (Figure 2).
- Layout of the new pipe System (Figures 3-5).
- Build the pipe system using new components from the station accessory material and the Extension Kit EDS WMGT WorldSkills 2026 Shanghai.
- Stabilize the pipe system with the following number of holders in the best places you decide.
    - Figure 3: with 2 pieces on the profile plate.
    - Figure 4: with 3 pieces with spacers on the profile of tank and 1 piece on the profile of the electrical I/O board.
    - Figure 5: with 2 pieces on the profile plate.
- Install the new submersible pump including the new pipe system.
- Install the stirrer (Figure 6).
- Assemble the supply tank with the submersible pump and filter units according to the new P&ID (Figure 2). Use flexible hose to connect the station to the supply tank system. Connect the prepared electrical cable from the station to the supply tank system.

Note: Ensure the return line is installed with a downward slope without counter-gradients for a clean drainage from the upper tank to the supply tank.

- Safety: Check that all outlets are plugged in and check that everything is connected properly.
- Install the motor controller for the stirrer and relay on the additional top-hat rail at the specified position on the profile system. (Figures 7 and 8).
- Set up the sensor B414 at 7.0 L ± 0.2L.
- Connect the sensor B423

3. Additional information on the electrical system

Note: For safety reasons, do not switch on the system during this part of the task or when filling the Supply water tank for the first time.
Please do not shorten the electrical wires leading to the sensors and actuators.

- Connect the stirrer to the motor controller according to the electrical schematic (Figure 10).
- Connect the submersible pump to the relay and the relay to the I/O board according to the electrical schematic. (Figure 11).

© WorldSkills International

- Note about the evaluated area (Figure 7).
- Connect sensor S0 to the I/O board -4A10 (white(WH) = I0 and Brown(BN) = 24VB) and that the signal goes off between 3.0L and 4.0 L.

4. Set up the station

- Information about the connection I/O-Board - EasyPort - PC - Software FluidLab Water management and EasyPort - Power supply (Figure 12 & 13):

For safety: Leave the power supply unit switched off while you're making the connection.

5. Test and document the station's results according to the report.

© WorldSkills International

Name:	SBR - (Wastewater treatment station)	Order number:	WorldSkills 2026
No.	**Activity**	**Done**	**Note/observation/result**
1	Install and connect all the points from point 2.	☐	
2	Connect all the points from point 3.	☐	
3	Connect the EasyPort USB to the power supply unit and connect all the required cables to the I/O board. See point 4.	☐	
4	Switch the power supply unit on and then connect the USB cable to the PC.	☐	
5	Check that the EasyPort address is set to "4" Press both arrows on the EasyPort at the same time, then change it with the arrows and confirm it by pressing both arrows at the same time again.	☐	
6	Start the Software FluidLab Water Management.	☐	
7	Click "initialize" and under the Station TRE - Address 4, an image of an EasyPort with a green led must appear. If there are any connection problems call the expert.	☐	
8	Click the "TRE" station button. After that the station overview will open (Figure 14).	☐	
9	Click "Start" in the "Execution" Area and not in the control panel area. This "Start" button starts the communication between software and hardware. After this, all signals must be transmitted from the hardware to the software and from the software to the hardware. Figure (14).	☐	
10	Check the pipe system for any leaks, that everything is connected correctly and that all screw connections are closed.	☐	
11	Start the submersible pump by switching the button "D-M501" for digital on.	☐	
12	Following actuators must function correctly and be assigned to the correct output signals: P501, P401, PA0, AG7, Aeration system.	☐	
13	Set up the motor controller so that the AG7 runs slowly. When the stirrer is running, the water surface must remain calm without any swirling effect. (Figure 15).	☐	

© WorldSkills International

14	Function of the following sensors must be working on the correct input signals: LSH B414 at 7L +/- 0,2L LSL B413 LSL S512 FIC B402 LSL S0 The Sensors must detect the water in the tank and display the signal visually in the software at the correct input signal. LSL B423 must always have a high signal. It is not allowed to fill the Tank B402 with water or change the electrical wiring to manipulate this signal. Find a suitable way to improvise, see Figure 16.	☐	
	Tests with the systems		
20	Empty Tank B401 using the pump PA0 from 7L until the float switch S0 signal goes OFF.	☐	_____ seconds
21	Empty Tank B401 using the pump PA0 with only a short start impulse of the pump PA0 (1 sec ON and then OFF) from 7L to that level that the float switch S0 signal goes off.	☐	_____ seconds
22	Empty Tank B401 using the pump P401 from 2,5L until the tank is empty.	☐	_____ seconds
23	Empty Tank B401 with only a short start impulse of the pump P401 (1 sec ON) from 2,5L to empty.	☐	_____ seconds
24	What is the average flow rate when filling tank B401 from 0L to 7L via pump P501? Manual valve V501 must fully be open.	☐	_____ _____ _____ = _____ L/min
Date and finish time	_____	**Test carried out by:**	Country: _____ Competitor: _____

© WorldSkills International

To continue

Index of Figure

Figure 1. Orange Circle: Uninstalled pipe system including tank connector*. Don't use or disassemble these pipes for other things!*

Figure 2. New P&ID of the EDS WMGT TRE Station including SBR.
1: See Figure 3; 2: See Figure 4; 3: See Figure 5.

Figure 3. The new pipe system.

Figure 4. The new pipe system**.**

Figure 5. The new pipe system.

Figure 6. Fix point for the stirrer.
1: Cable area - what will be evaluated; 2: Cable area outside the blue box will not be evaluated.
Note for the Submersible pump: The power cable can be routed temporarily through the lid of the tank. The cable from the stirrer and submersible pump must be routed along this profile

Figure 7. I/O Board. 1: Cable areas - what will be evaluated and profile to the stirrer; 2: Cable areas outside the blue box will not be evaluated 3: Profile mounting place for the electrical extension.

Figure 8. I/O Board. 1: Relay for the submersible pump in the tank B401; 2: Motor controller for the stirrer; 3: Electrical cables route.

Figure 9. I/O Board.

Figure 10. Stirrer and motor controller.
Circle: All these lines you must connect to the digital SysLink block(-4A10) with blue cables. For the 24VA you must use a double ferrule, together with the connection to the 24VA relay see figure 10.

Figure 11. New relay K50 and submersible pump -MA0.

Figure 12. I/O-Board - EasyPort USB - PC connection.

Figure 13. FluidLab Water Management - menu station "TRE".

Figure 14. Information about how to control the new actors and see the signals of the new sensors.

Figure 15. Water surface when running the stirrer (no swirling).

Figure 16. P&ID of the standard EDS Water Management Station.

© WorldSkills International

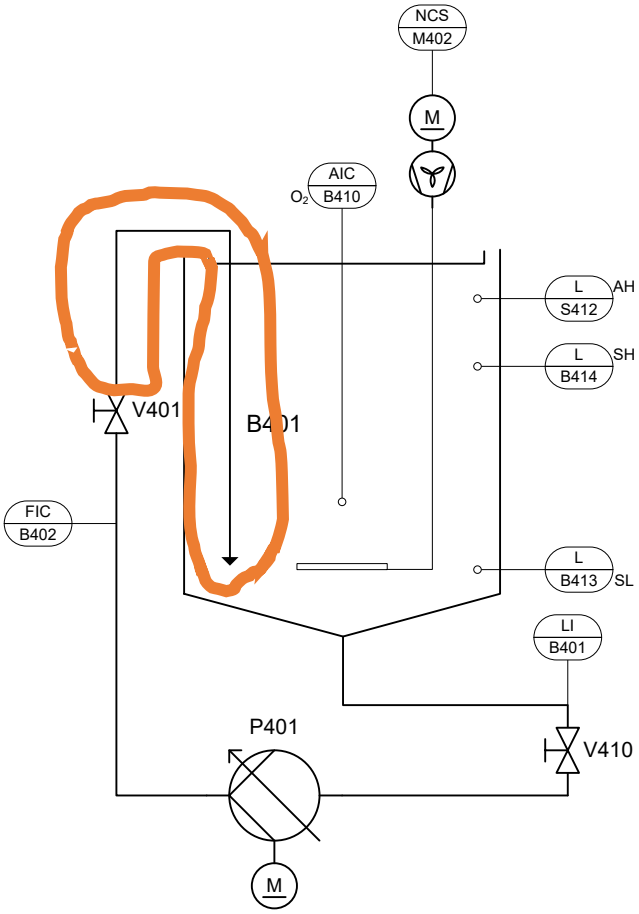


Figure 1. Orange Circle: Uninstalled pipe system including tank connector.

Don't use or disassemble these pipes for other things!

© WorldSkills International

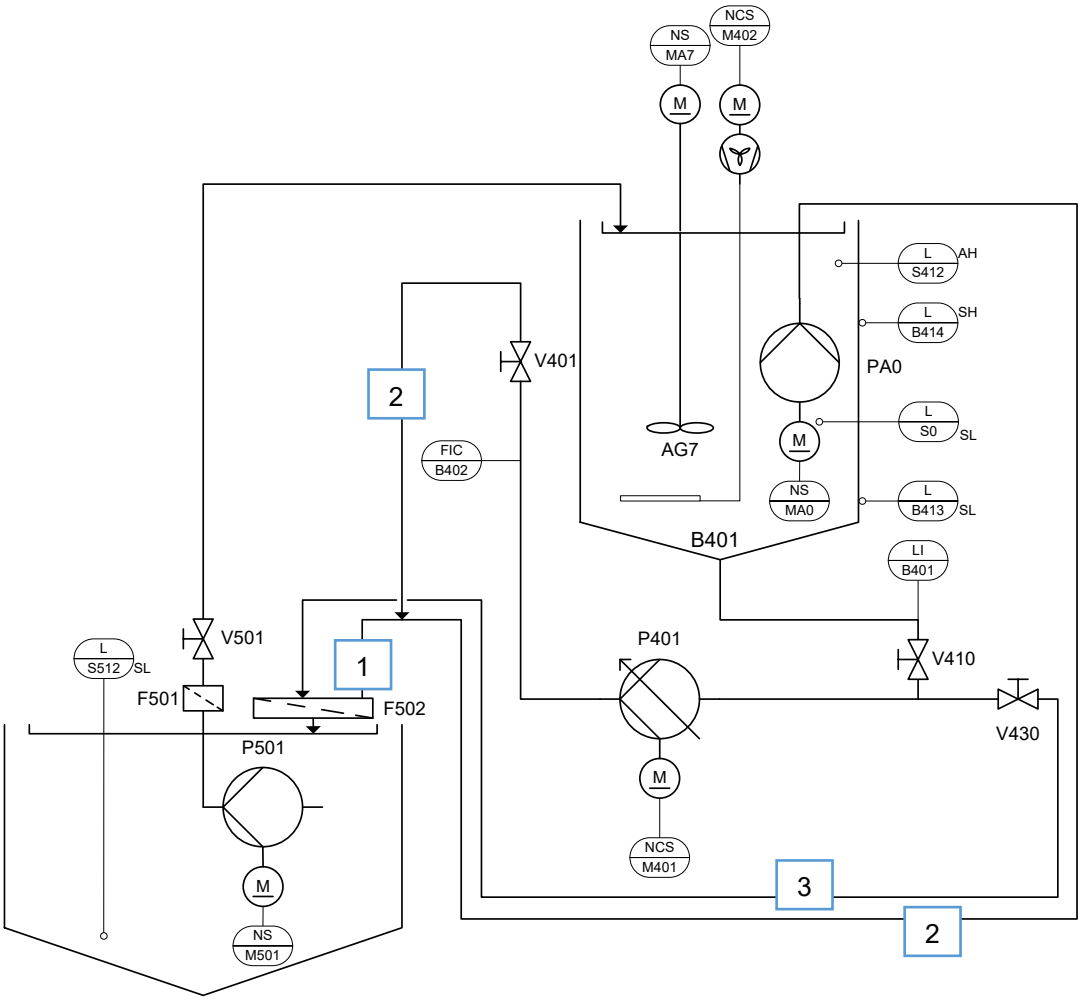


Figure 2. New P&ID of the EDS WMGT TRE Station including SBR.

1: See Figure 3;

2: See Figure 4;

3: See Figure 5.

© WorldSkills International

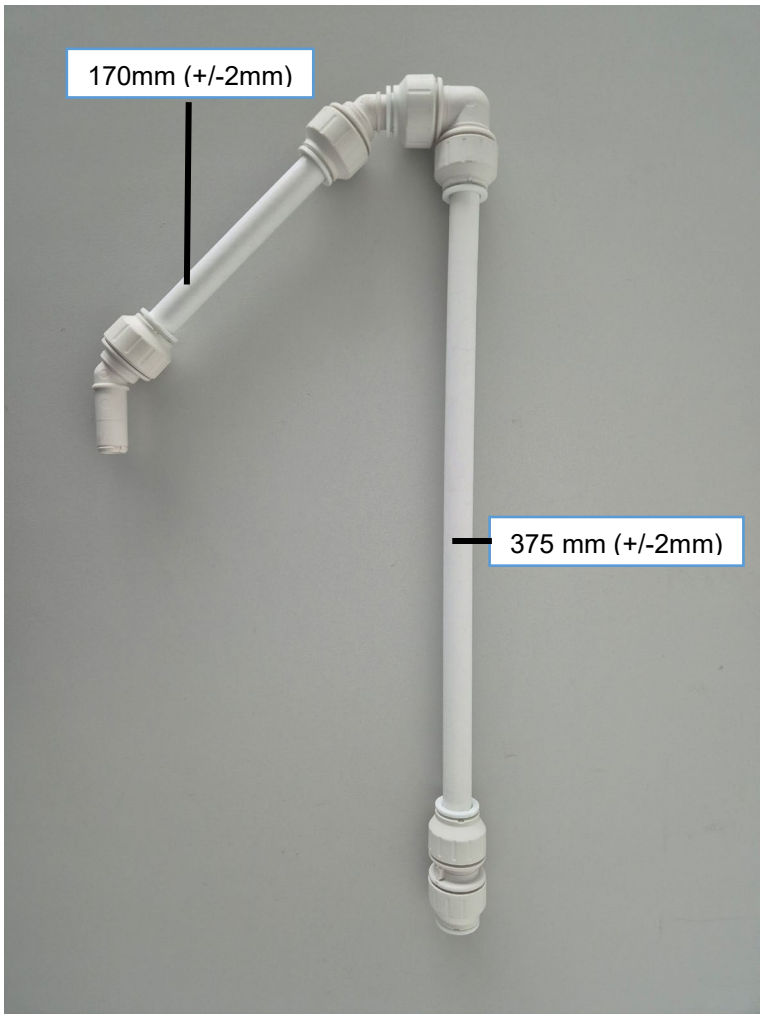


Figure 3. The new pipe system.

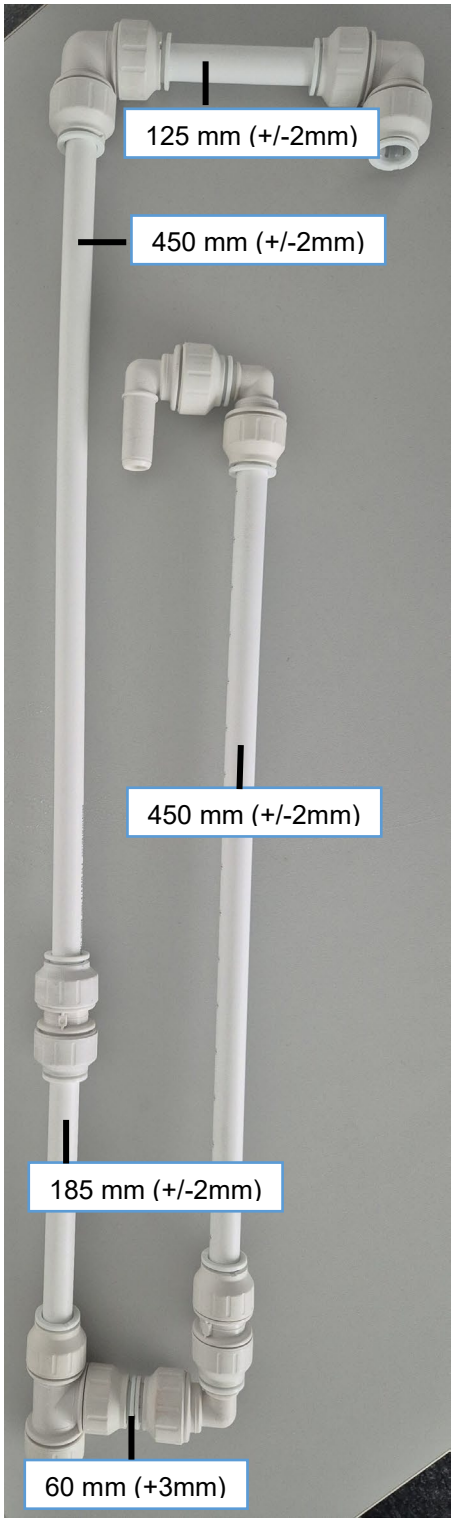


Figure 4 The new pipe system.

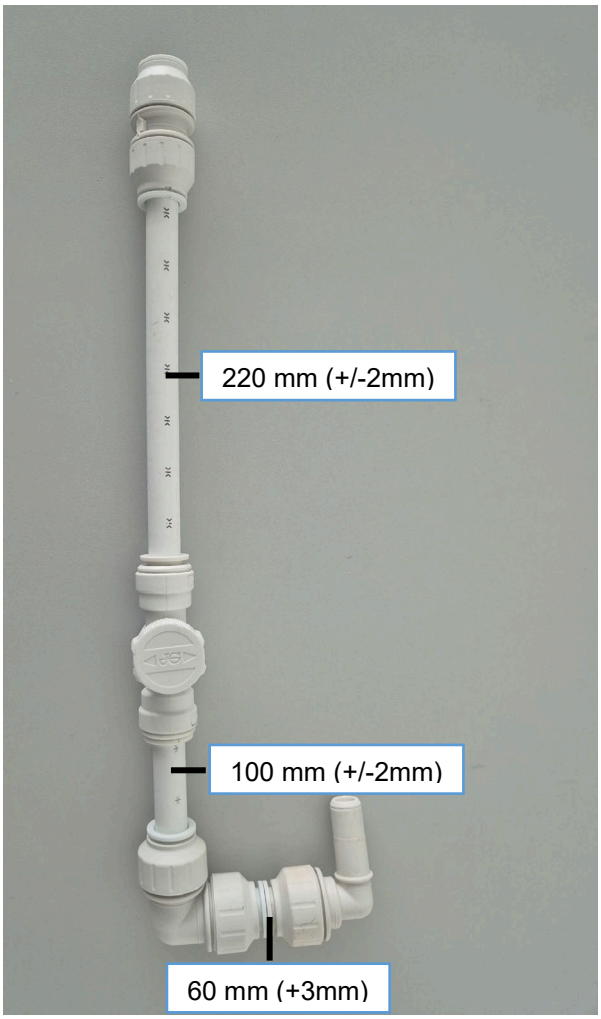


Figure 5. The new pipe system.

© WorldSkills International



Figure 6. Fix point for the stirrer.

1: Cable area - what will be evaluated;

2: Cable area outside the blue box will not be evaluated.

Note for the Submersible pump: The power cable can be routed temporarily through the lid of the tank. The cable from the stirrer and submersible pump must be routed along this profile.

© WorldSkills International

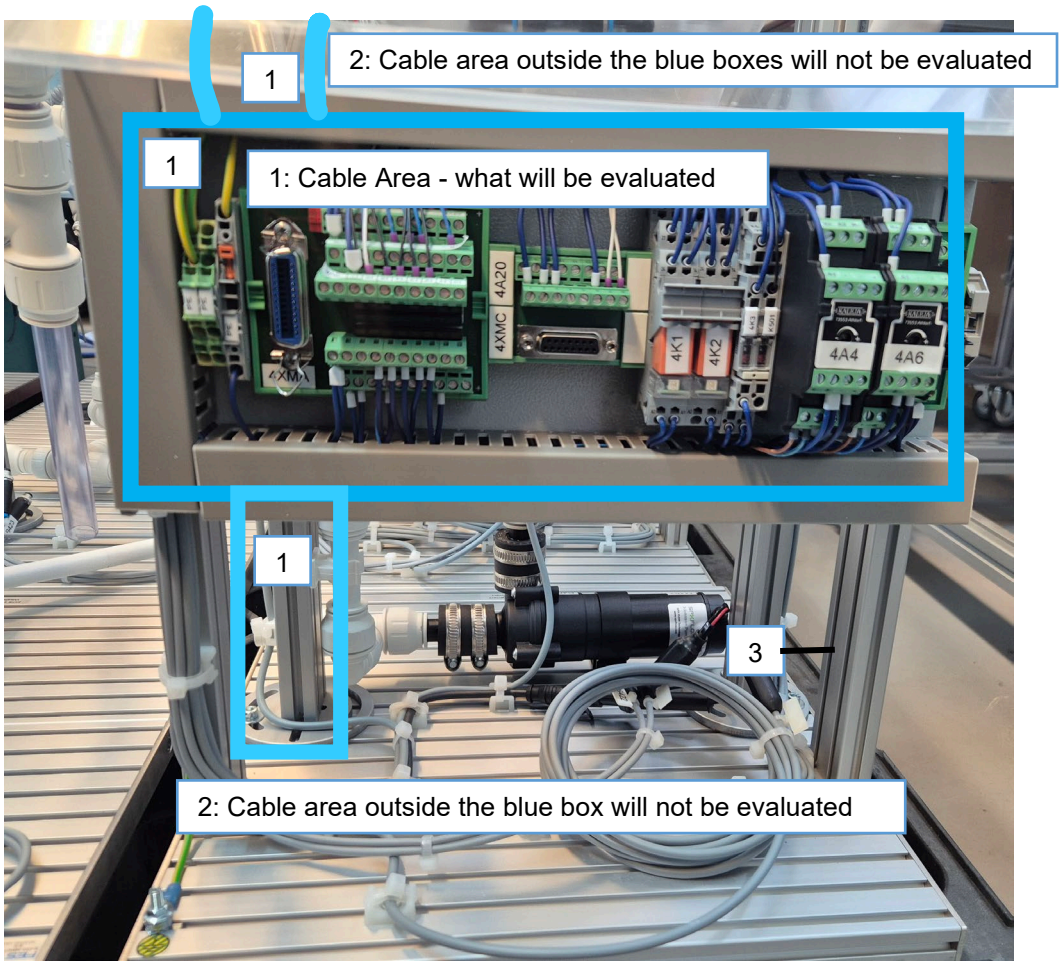


Figure 7. I/O Board.

1: Cable areas - what will be evaluated and profile to the stirrer;

2: Cable areas outside the blue box will not be evaluated;

3: Profile mounting place for the electrical extension.

© WorldSkills International

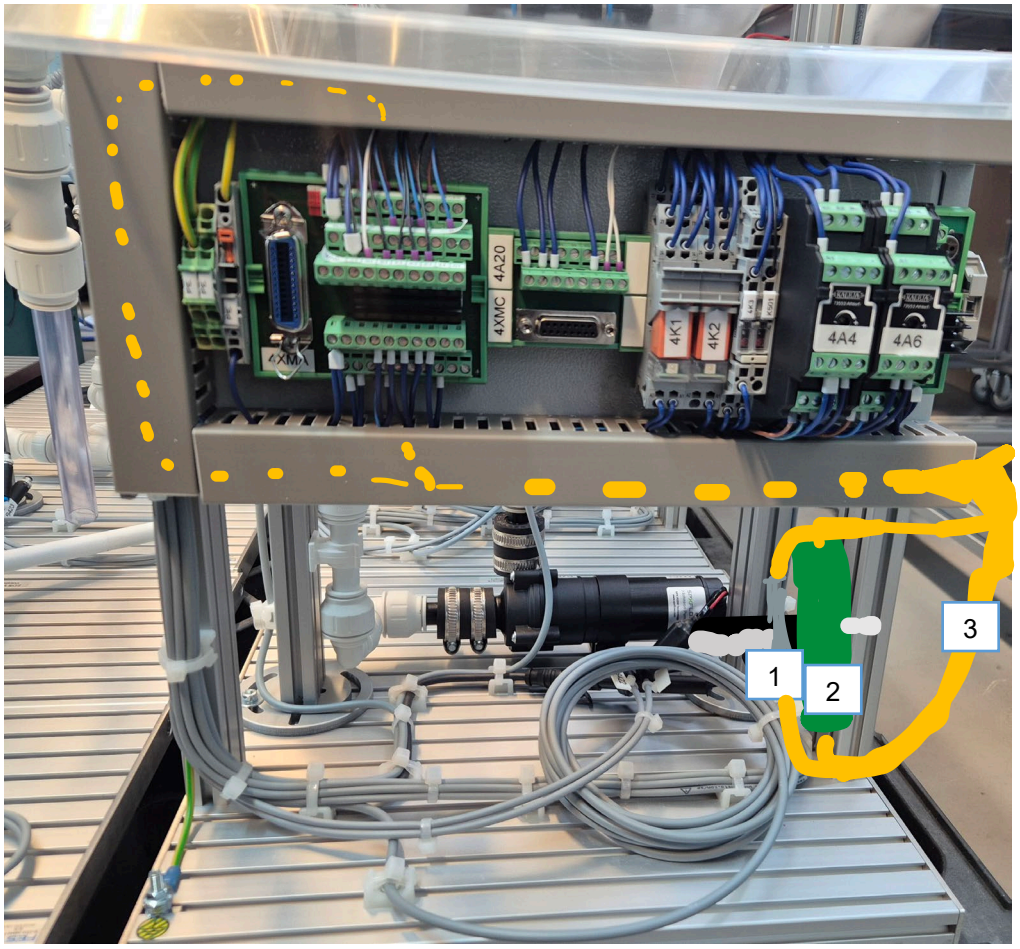


Figure 8. I/O Board.

1: Relay for the submersible pump in the tank B401;

2: Motor controller for the stirrer;

3: Electrical cable route.

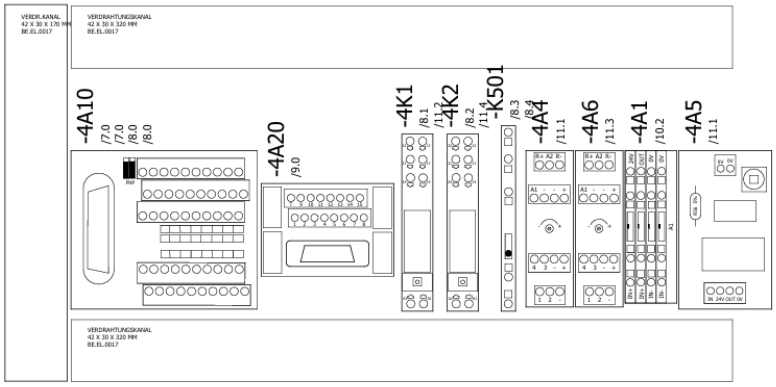


Figure 9. I/O Board.

© WorldSkills International

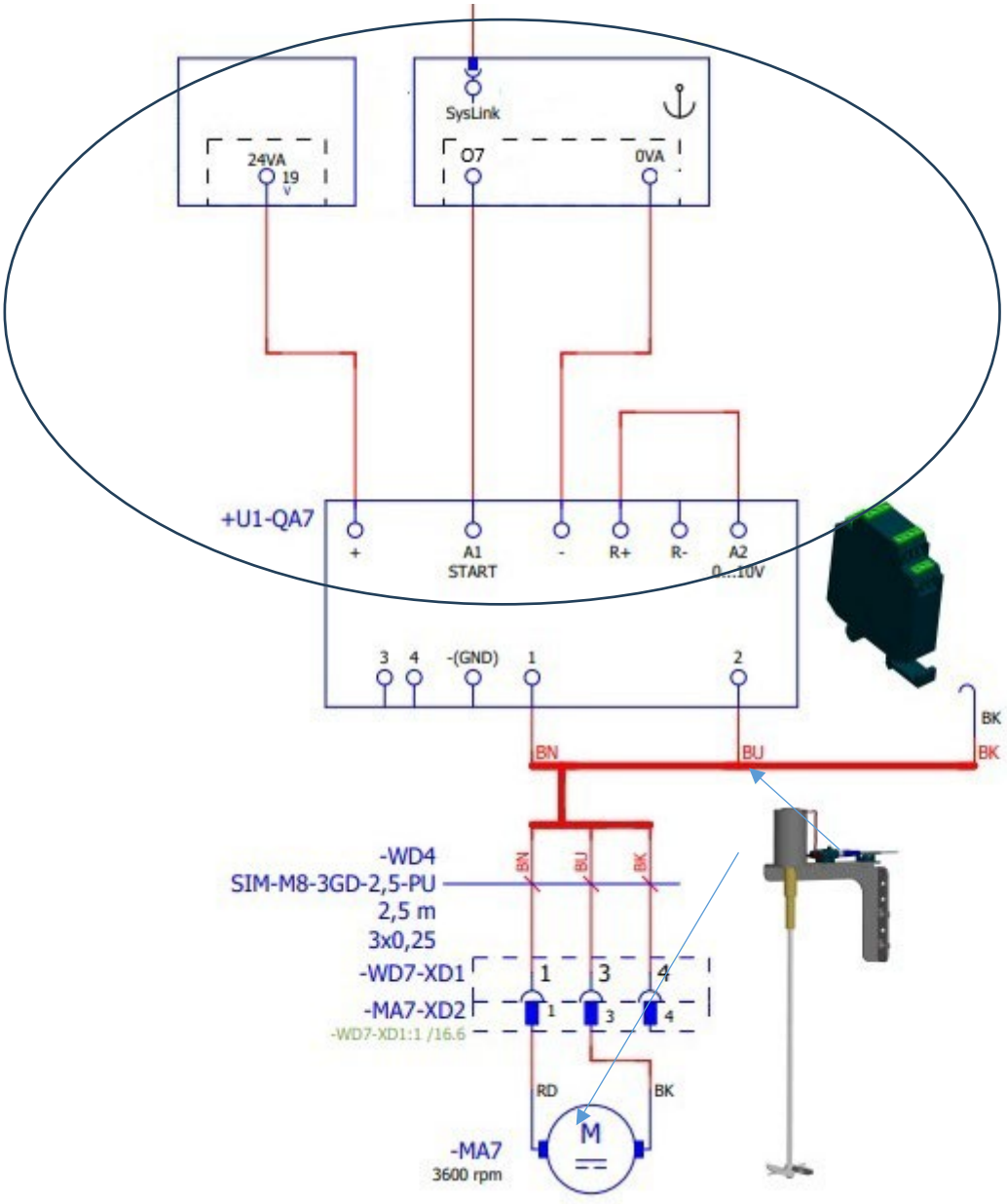


Figure 10. Stirrer and motor controller.

Circle: All these lines you must connect to the digital SysLink block(-4A10) with blue cables. For the 24VA you must use a double ferrule, together with the connection to the 24VA relay see figure 10.

© WorldSkills International

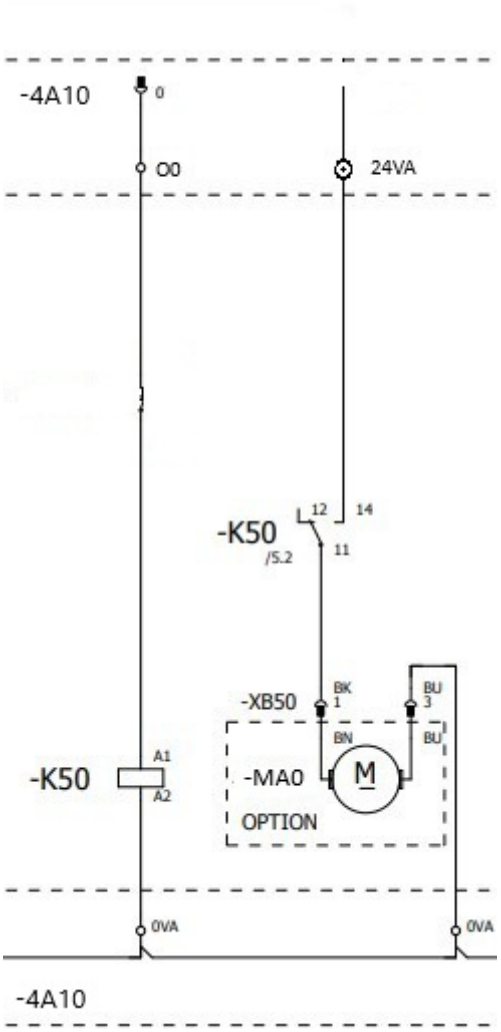


Figure 11. New relay K50 and submersible pump -MA0.

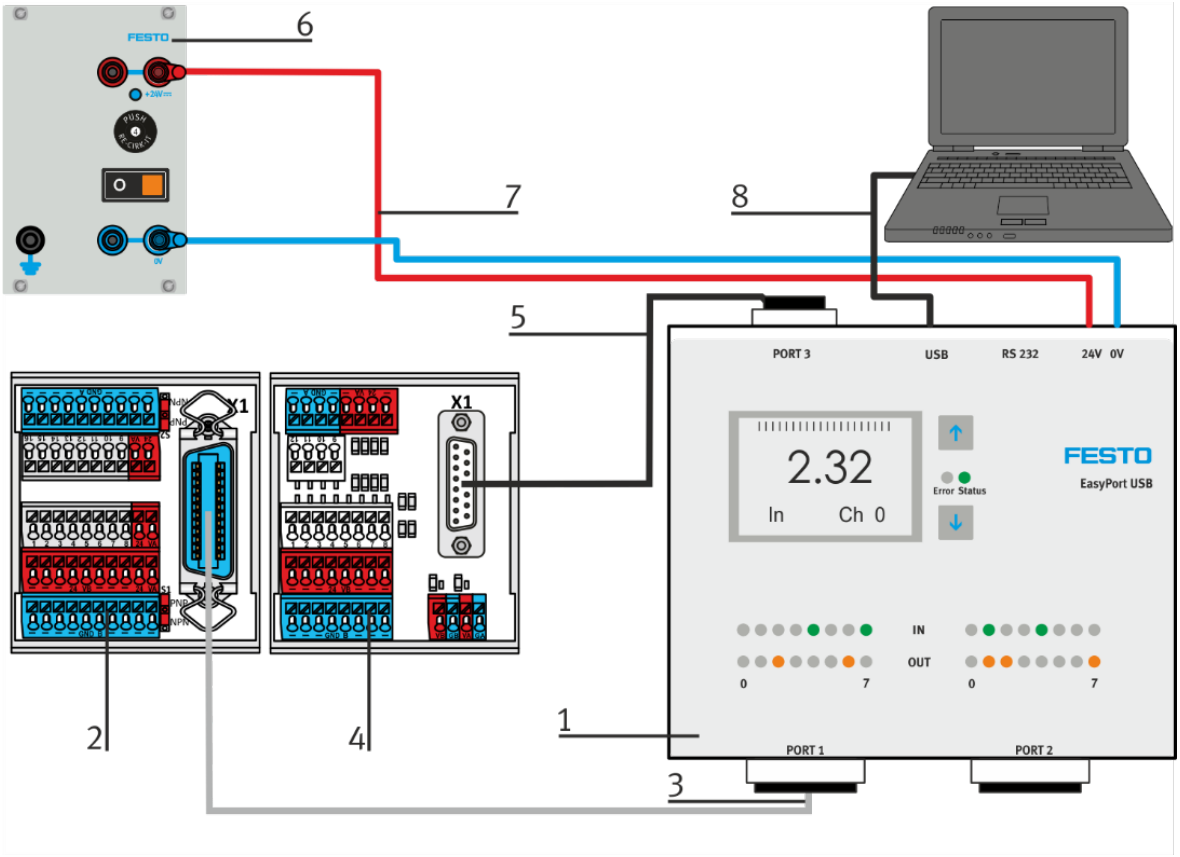


Figure 12. I/O-Board - Easyport USB - PC connection.

© WorldSkills International

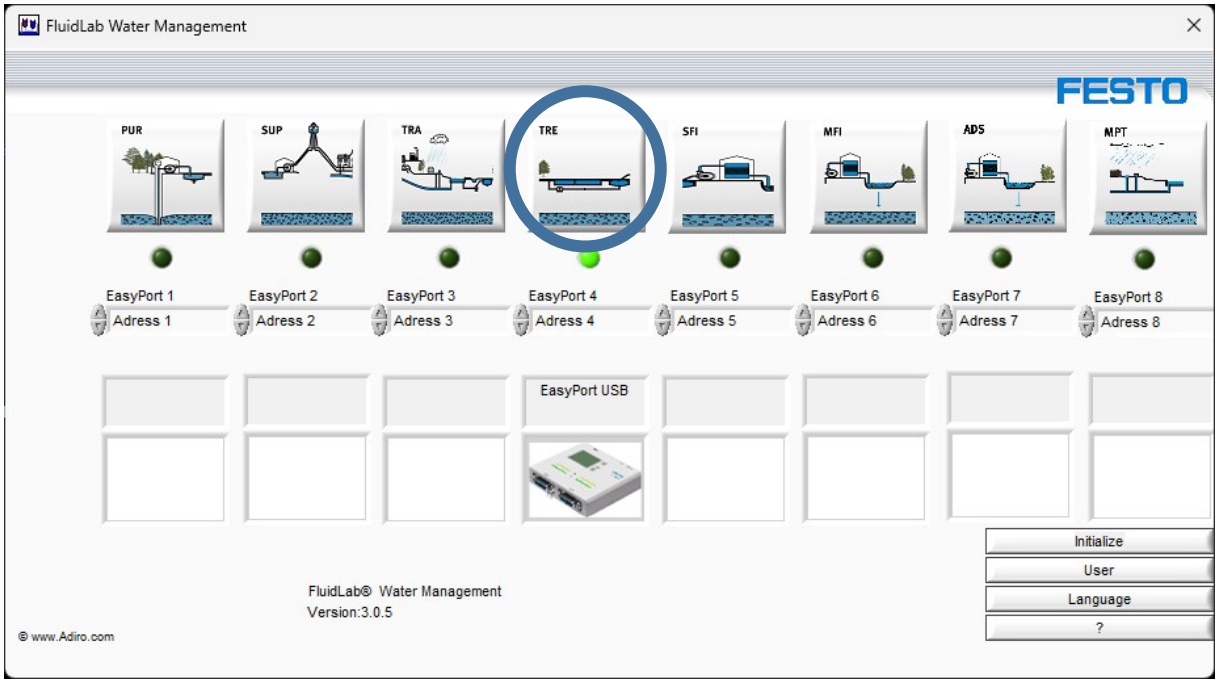


Figure 13. FluidLab Water Management - menu station "TRE".

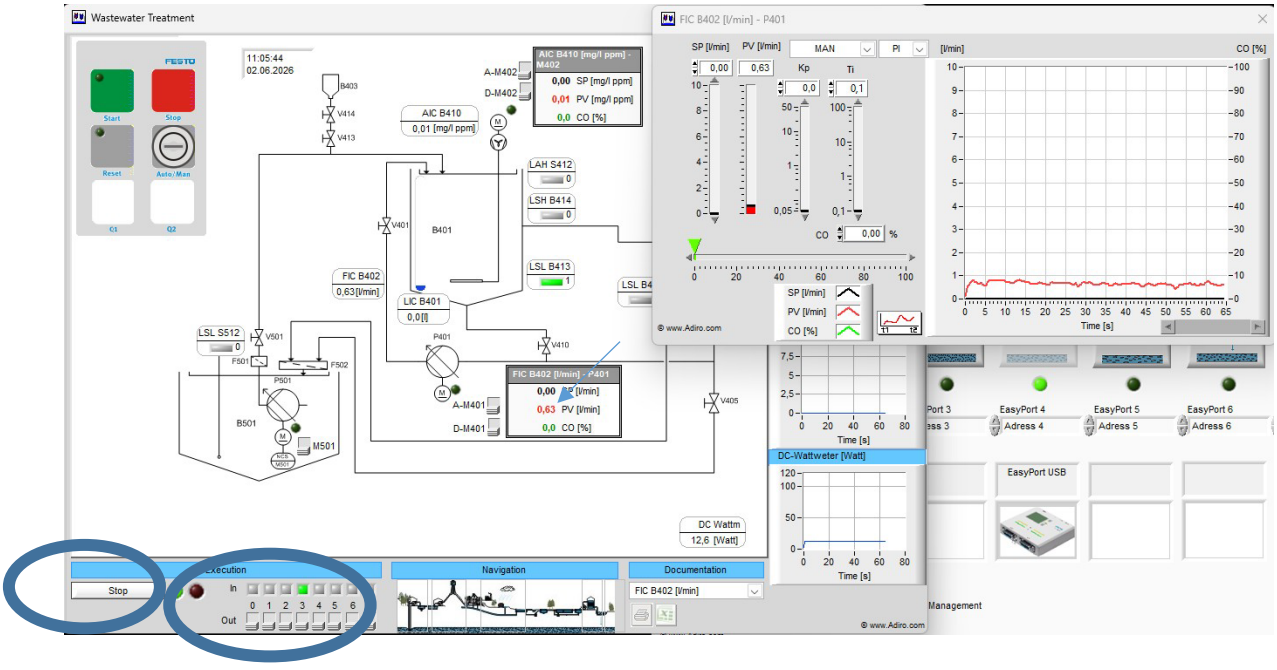


Figure 14. Information about how to control the new actors and see the signals of the new sensors.

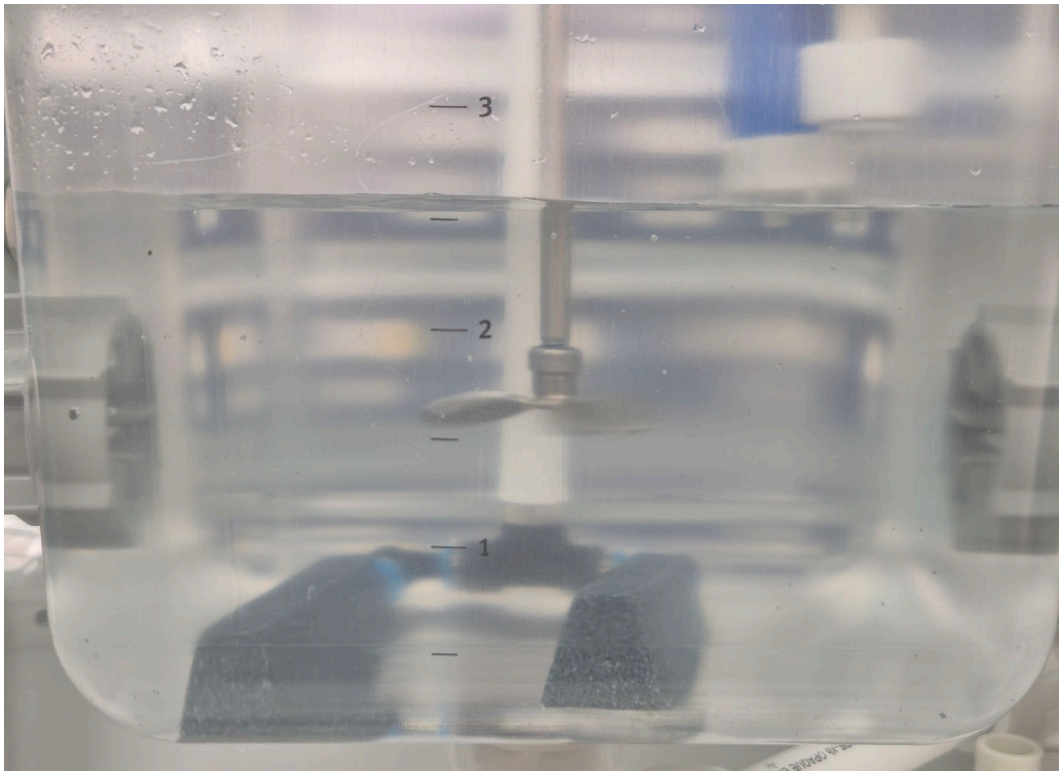


Figure 15. Water surface when running the stirrer (no swirling).

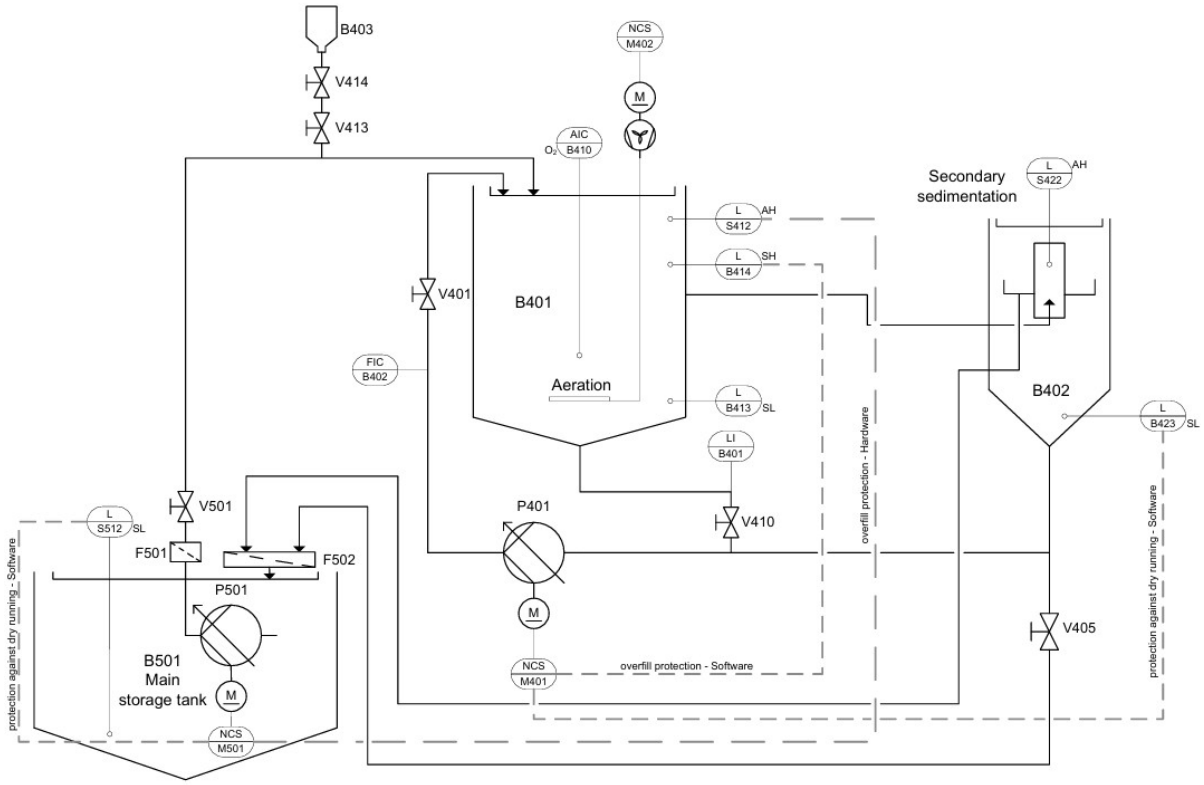


Figure 16. P&ID- of the standard EDS Water Management station.

© WorldSkills International

Task Forms

Country: _____ **Competitor Name:** _____

Marking Scheme

The task evaluation will be made according to the Competition Information System (CIS) of Water Technology 2026.

© WorldSkills International