

World University Underwater Robot Competition – Multinational Underwater Robotics Competition Category AUV

1 General Information

This document is the main regulation for AUV categories of the International Underwater Robotics Competition (WUURC-MURC 2026).

Competition date: August 14-16, 2026

Venue: Water Sports Palace, 147 Moskovskaya St., Brest.

Competition composition

- Specification Sheet - 10 points
- Pool mission performance - 190 points

TOTAL : 200 points.

Participants and categories

- AUV category: 2-5 people per team. Senior school students (grades 9-11), university students.

Robot requirements

- **Robot: autonomous.**
- Programming language: no restrictions.
- Robot power supply: <72V.
- Total power consumption: up to 350 W.
- Power source: on board.

- Robot dimensions and weight are not regulated.
- The robot must not have any installed parts (sharp, pointed objects, bare wires, etc.) that could damage the pool or team members.
- Each team competes with its own robot. Two teams using the same robot is not allowed.

Team Spec Sheet

Worth 10 points.

The Team Spec Sheet is intended to give the judges a brief overview of the team and its vehicle. The Spec Sheet must fit on one A4 page, be provided in PDF format, and be less than 2 MB in size.

The Spec Sheet must include the following information:

About the team

- Name of the organization the team represents;
- City, region, country;
- History of participation in this competition (if any). If none, state that they are rookies.
- Team photo with caption (First name Last name, grade/level, role in the team, etc.). The photo must include all team members.

About the AUV

- Vehicle name (if any);
- Vehicle cost (total cost of components);
- Vehicle size and weight;
- Total student-hours spent by team members on design, manufacturing, and assembly of the robot;
- Payload;
- Program features;
- Safety features;
- High-quality photo of the robot.

The Team Spec Sheet must be uploaded to the form by August 12, 2026 inclusive.

Specification Sheet evaluation criteria

Requirement	max
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Is one page length	0.5
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Submitted by the deadline 0.5

File name follows naming convention (see line below) 0.5
(e.g. School or organization name_team name_Spec
Sheet_2026.pdf)

About team

Team name and school, club, or organization name 1

City, country 0.5

Distance traveled to the competition 0.5

History of WUURC competition participation (new or
returning) 0.5

Team photo and caption with team members' names
and roles 1

Range of grade/college levels represented by team
members 0.5

About AUV

AUV name (if applicable) 0.5

Total cost 0.5

Size and weight measurements	0.5
Total student-hours to design and build	0.5
Safety features (which ensures the safety of AUVs and operating personnel)	0.5
Program features (functions, libraries, algorithms, etc.)	1
Special features (devices, etc.)	0.5
Photo of the vehicle	0.5
TOTAL	10

2 Competition task

Workstation

The station consists of a table and 2 chairs, a power outlet, located approximately 1 meter from the pool. The pool depth from 0.6 – 1.5 m (pool depth may vary depending on the competition venue). The team must bring to the station the laptop, monitors, and other equipment necessary for operating the robot.

Time limit

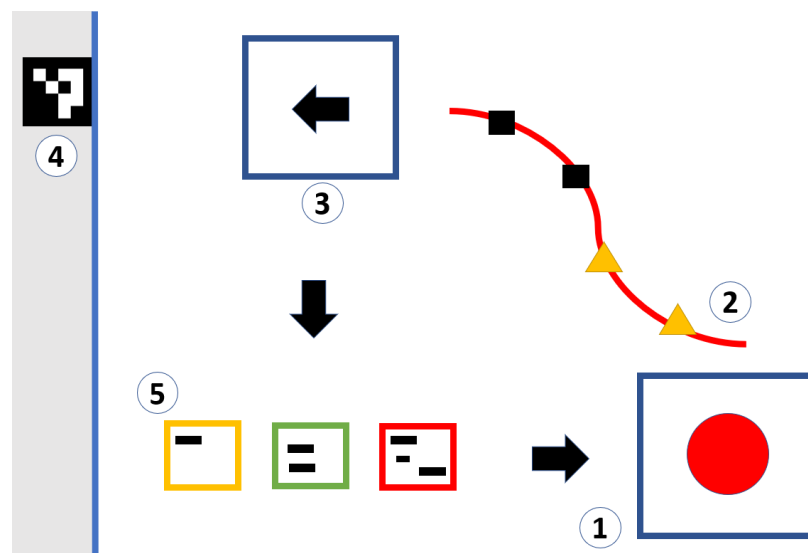
Each team will be given 2 attempts to complete the mission, each lasting 20 minutes. Within one attempt, the team has the right to make three deployments of the vehicle. The maximum duration of one deployment is 5 minutes.

Thus each attempt consists of three parts:

- Preparation for the mission - 3 minutes
- Deployments (15 minutes)
- Clearing the station - 2 minutes

Legend:

In the Brest region, in the flooded area of the old bed of the Western Bug River during the construction of a hydroelectric facility, there is an underwater section of the main gas pipeline "Brest – Warsaw". Recent geomagnetic studies have revealed an anomaly: several sections of the pipeline passing over a flooded peat bog have "floated" out of the silty bottom, creating emergency spans. The AUV must automatically conduct a detailed inspection of the problematic section: identify yellow leakage markers and black contamination markers, take water samples for ecologists, find the coordinates of exposed sections (using ArUco markers), and install a signal beacon. Successful completion of the mission will prevent an environmental disaster in the zone of Białowieża National Park.

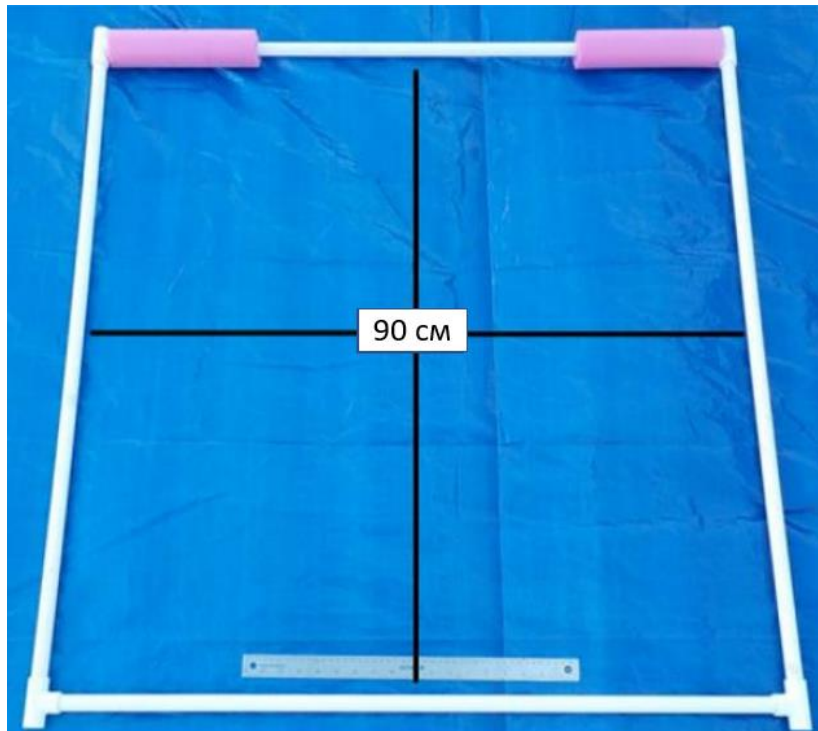


Mission scheme

- 1 - start frame
- 2 - pipeline
- 3 - task acquisition area
- 4 - ArUco marker
- 5 - Pipeline sections

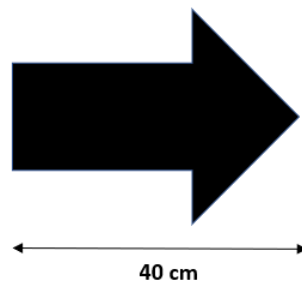
Starting position

The vehicle starts from a square frame 90x90 cm.



For ease of orientation at the bottom under the start frame, a red circle of diameter 30 cm will be placed.

Also, between tasks, there are directional signs with black arrows.



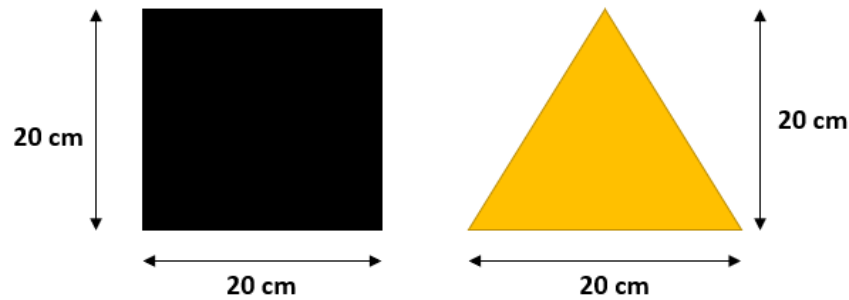
Directional arrow

Task 1. Maintenance of the main pipeline

At the bottom there is a pipe 5-10 m long, simulating a pipeline section. On the pipe there are yellow circles and black squares.

- Yellow circle indicates a possible leak location
- Black square – contamination
- At the end of the pipe there is a basket.

It is necessary to inspect the pipe.



Colored markers

If a leak is detected, the vehicle must blink red once above the marker and touch the marker.

If contamination is detected – blink green twice above the marker, rotate 360 degrees above the marker.

- Inspection completed - 10 points

The step is considered completed if the vehicle travels from the beginning of the pipe to its end and performs actions above at least one marker.

- Defect detected
 - Indicated by the correct color - 20 points (5 each)

The step is considered completed if the vehicle blinks the correct number of times with the specified color (yellow circle – red once, black square – green twice).

- Correct action performed - 40 points (10 each)

The step is considered successfully completed if the vehicle performs the correct action above the marker. Circle – touching the marker, square – rotating 360 degrees.

TOTAL FOR THE TASK: 70 POINTS

Task 2. Environmental monitoring

In the area where the main pipeline is located, a series of studies must be carried out to assess the ecological state.

The team must develop and bring its own water sampler that will allow taking and delivering to the surface at least 50 ml of water. The design of the sampler can be any. The main condition is that at the start of the mission the sampler must be empty.

Requirements for the water sampler:

1. Dimensions no more than 20x20 cm.
2. Must allow collecting up to 50 ml of water.
3. Sample collection can be performed at any depth.
4. Must be empty at the start of the mission.
 - Water sample taken - 40 points

The team must bring its own water sampler to the station. And with its help take a water sample at any depth.

- 40 points - at the end of the mission, the sample contains more than 50 ml of water
- 20 points - at the end of the mission, the sample contains less than 50 ml of water.
- Sample delivered - 20 points
 - automatically - 20 points
 - manually - 5 points

The step is considered successfully completed if, after collecting the sample, the vehicle surfaces within the start frame and drops the sample onto the pool edge.

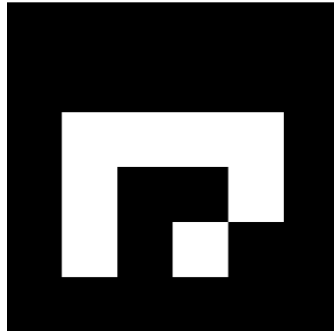
The sample is considered delivered automatically if the sample is dropped onto the pool edge by the vehicle.

The sample is considered delivered manually if, after the vehicle surfaces, the team retrieves the sample by hand.

TOTAL FOR THE TASK: 60 POINTS

Task 3. Search for sections of the gas pipeline protruding from the silt

At the bottom there is a sign with an arrow. Above the sign there is a 90 cm frame (task acquisition area). The arrow points to the location of the sign with the ArUco code.



Example of a sign with an ArUco code

ArUco markers from the OpenCV library set 4x4_1000 are used

4x4 ArUco markers (pre-defined dictionary of 1000 IDs).

The marker encodes numbers from 1 to 6 inclusive. The numbers indicate the pipeline section to be inspected.

1,2 - yellow sector

3,4 - green sector

5,6 - red sector

The vehicle must reach the section and drop a signal beacon onto the section. The signal beacon is a golf ball.



Signal beacon

The pipeline sections are frames made of red, yellow, and green pipes. Frame dimensions 50x50 cm.

- Vehicle surfaced in the task acquisition area - 10 points

The step is considered successfully completed if any part of the vehicle surfaces within the frame.

- Task acquired - 10 points

The step is considered successfully completed if the vehicle recognizes the ArUco code and turns on an LED matching the color of the encoded sector for a few seconds.

- Sector inspected - 10 points

The step is considered successfully completed if the vehicle reaches the required section and the robot's projection is inside the frame. The first visited sector is counted.

- Beacon dropped - up to 20 points
- 20 points for correct sector
- 10 points for another sector

The step is considered successfully completed if the vehicle drops the beacon into the sector that was to be inspected.

TOTAL FOR THE TASK: 50 POINTS

Task 4. Mission completion

The mission is considered completed if the vehicle returns to the start point and/or surfaces and a team member says "Stop".

- Vehicle surfaced in the start frame - 10 points.

TOTAL FOR THE TASK: 10 POINTS

TOTAL FOR THE MISSION : 190 POINTS

Initial conditions

1. Before the attempt, the organizers determine the positions of the signs and mock-ups.
2. The order of arrangement of mock-ups does not change, but the distances by which they may be separated from each other may be changed.
3. The position of the signs remains unchanged for all teams during the same attempt.
4. The position of the starting sign (circle) remains unchanged.
5. Before the start, the robot must be on the water surface in the start zone. Program start is allowed via mechanical switches, via wireless networks, or by launching the program directly on the laptop.
6. The robot is launched from a square frame 90x90 cm.
7. Before launch, the team must orient the vehicle perpendicular to the starting pool edge.
8. Under the frame at the bottom of the pool there is a red circle of diameter 30 cm. The depth of the field is set on the competition day and does not change throughout the competition day.
9. Pool depth from 1 to 2 m

End of attempt

The attempt ends in the following situations:

Normal situations:

- The robot surfaces a second time in the start frame, a team member signals the end of the mission.
- The robot surfaces, a team member signals the end of the mission.
- The robot leaves the trajectory.

Abnormal situations:

- The maximum attempt time has expired;
- The captain asks the judge to end the attempt;

Critical situations ending the attempt:

- The robot violates other requirements described in the rules;
- The participant violates other requirements described in the rules.

3 General rules

1. Before the competition, the organizers publish the schedule of practice sessions and attempts. Team attempts are carried out according to the schedule. On competition day, swapping time slots with other teams is prohibited. If a team does not show up for an attempt in the order of its performance, the team is awarded zero points for that attempt. No exceptions to this rule are provided.
2. On the first day of the competition, teams must pass a safety inspection to prove that their vehicle meets the AUV requirements. If a judge identifies a deviation of the vehicle's characteristics from the requirements, the team has the opportunity to correct the issues and undergo inspection again on the first practice day. Teams that do not pass the safety inspection will not be allowed into the mission performance area.
3. Team mentors may be present at the workstation during practice sessions. During competitive attempts, the presence of mentors at the workstation is prohibited.
4. Participants from other teams MAY NOT be present at the workstation or assist members of another team.
5. Within the competition, each team has two attempts to complete the mission. The points from the BEST attempt count.
6. Within an attempt, teams may make three deployments. The BEST deployment counts for the attempt.
7. Teams are prohibited from leaving any trash in the pool. Any trash must be removed before the attempt time expires, otherwise the team receives penalty points. Trash includes: any parts of the AUV, weights, floats, any other items,

used objects. Mission mock-ups are not considered trash unless otherwise stated in the regulations.

8. Mission judges, presentation judges, and other officials communicate only with team members regarding competition issues. If a team has an objection to the mission performance assessment, the team must immediately contact the judge before signing the score sheet. If the team signs the score sheet, the judges consider that the team agrees with the results and they cannot be disputed.

If a decision on a team's request cannot be made by the mission judges, they consult with the head judge and/or the competition technical director to reach a final decision.

After the head judge/technical director announces the decision on the team's request, that decision is final and not subject to appeal. If a team attempts to further appeal the decision, the team may be assessed penalty points.

Mock-ups

1. Tolerances on the length of pipes, strips, signs specified in the regulations are allowed during mock-up manufacturing. The organizers recommend not using the mock-up dimensions specified in the regulations for calibrating measuring devices.
2. The organizers may add additional buoyancy blocks and weights to the mock-up structure to achieve its stability.

Conduct of the competition

1. The competition organizers prepare a schedule for robot debugging in the pool. Each team must undergo a technical inspection of the robots for compliance with requirements.
2. Each team conducts robot debugging and practice attempts according to the schedule.
3. In the final, each team will be given 2 attempts, during each attempt the team may perform 3 deployments, max duration 5 minutes.
4. First, a team member places the vehicle in the frame. Then they report that the team is ready for launch. After that, at the judge's command "Start", the launch is carried out.
5. The judge calls the teams according to the established schedule.
6. Between attempts, teams will be given time to debug the vehicle, during which they may make changes to the program. Testing in the pool during debugging is carried out on a first-come, first-served basis.

4 Determining the final ranking

1. In the final, winners are determined by the number of points. The best attempt and the time of that attempt are counted. If teams have the same number of points, the second attempt and the time of that attempt are taken into account.
2. If fewer than 3 teams participate in a category, the winner is determined by the percentage of points earned:
 - 1st place - 80% or more
 - 2nd place - 60% or more
 - 3rd place - 40% or more
 - If teams fall into the same range, the team with the higher number of points wins.
 - If the number of points is equal, the team that completed the task faster wins.
3. In the case of 3 or fewer teams in the final, if a team scores 0 points over two attempts, that team will not be awarded a prize place.