Sveučilište u Rijeci, Pomorski fakultet
University of Rijeka, Faculty of Maritime Studies

CENTER FOR MARINE TECHNOLOGIES

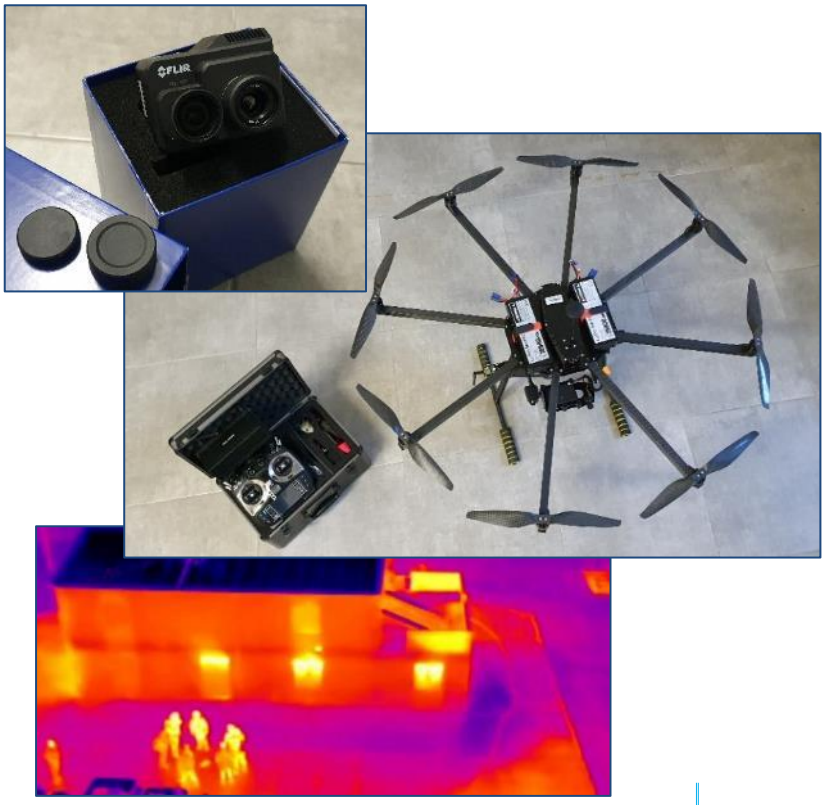
EQUIPMENT CATALOG

CONTENTS:

REMOTELY OPERATED UNITS

Equipment	**Underwater drone Blueye Pioneer**
Affiliation	University of Rijeka, Faculty of Maritime Studies
Short description and examples of use	Remotely operated underwater vehicle for high resolution video and photo recording. The drone is equipped with a light-sensitive camera and LED lights for recording at great depths or during night. It has four thrusters which allow it to move quickly and precisely in all directions. The drone has the automatic depth and heading (course) function, which facilitates the operation in demanding conditions or when the precision is needed. Examples of use: underwater ship's hull inspection, port structure inspection (docks, breakwaters, terminals, etc.), seabed inspection, inspection of mooring equipment in marinas, wreckage conditions, reef monitoring, inspection of pipelines, cables, drains and other facilities or structures at sea.
Technical specifications	• Dimensions: 485 x 257 x 354 mm (LxWxH) • Operating depth: 150 m • Speed: 1.5 m/s (3 knots) • Camera: FHD with a wide-angle lens 1080p/30 fps • Light: LED - 3300 lumens • Sensors: echo sounder, magnetometer (compass), temperature • Thruster power: 4 x 350 W • Estimated battery life: 2 hrs.
Additional information	https://www.blueyerobotics.com/products/pioneer
Funding	EU InterReg project AdriREEF
Contact	Lovro Maglić, Ph.D, e-mail: maglic@pfri.hr Vlado Frančić, Ph.D, e-mail: vfrancic@pfri.hr

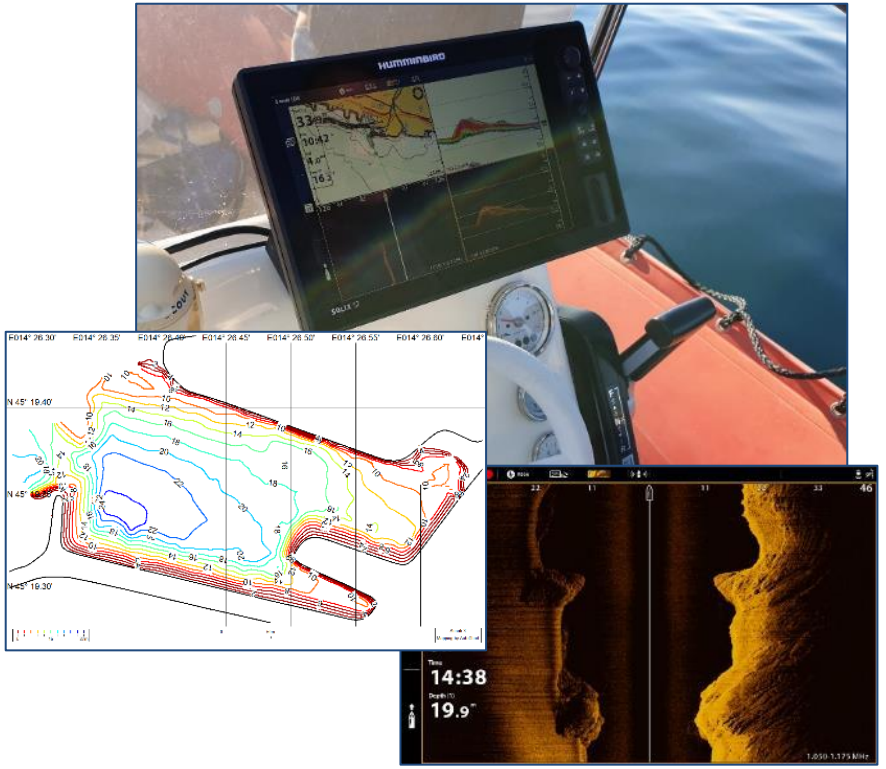
Equipment	**Unmanned Aircraft System JAZZ-Octocopter 1100**
Affiliation	University of Rijeka, Faculty of Maritime Studies
Short description and examples of use	The unmanned Aircraft System (UAS) is powered by eight electric motors, allowing flight operations with a maximum take-off weight of 7.16 kg. The UAS is equipped with a GPS module enabling precise and wanted positioning. The UAS is equipped with a professional action and thermal camera for high resolution video and photo recording. On the UAS can be integrated different sensors, like **Velodyne LiDAR Puck** used for mapping of surrounding area and object detection and **Sniffer4D Hyper-local Mobile Air Quality Mapping System** used for measuring air quality, concentration of chemical compounds and their dispersion. The flight time of the UAS is approximately 12 to 15 minutes, depending on flight conditions and the number of additional equipment. Examples of use: the taking high-quality photo and video recordings of fixed and mobile land or sea objects, which can be used for further photo and video analysis; area mapping and object detections; determining air quality and concentration of chemical compounds and their dispersion, other measuring depending on the mounted sensors.
Technical specifications	• Dimensions: 1.100 (Diameter) x 500 mm (Height). • No. of electromotors/Batteries: 8; 2xLi-Ion 10.000 mAh (5S). • Maximum Take-Off Weight: 7.16 kg. • Max. flight (without wind)/Ascent-Descent speed: 14 m/s; 3 m/s. • Max. Pitch angle/Angular velocity: 25°; Pitch: 200°/s; Yaw: 100°/s. • Max. Flight Altitude above Sea Level: 1.500 m. • Flight Time: 12-15 min. • Hovering Accuracy (GPS): Vertical: ± 0.5 m; Horizontal: ± 1.5 m. • (Thermal) camera: 1080p 60fps, 1080p 30fps, 720p 60fps.
Additional information	N/A
Funding	University of Rijeka, Faculty of Maritime Studies
Contact	Tomislav Krljan, MSc, e-mail: krljan@pfri.hr Neven Grubišić, Ph.D, e-mail: neven.grubisic@pfri.uniri.hr



Equipment	**Unmanned aerial vehicles DJI Phantom 4 Pro and DJI Phantom 4 Advanced**
Affiliation	University of Rijeka, Faculty of Civil Engineering
Short description and examples of use	Unmanned aerial vehicles are used for taking high quality aerial photos and video recordings. They are powered by 4 propellers, with the possibility of three-way camera stabilization (from - 90° to + 30°). Satellite positioning is provided by GPS and GLONASS systems. The flight time of both aircrafts is approximately 30 minutes, depending on the flight conditions. The DJI Phantom 4 Advanced is 20 grams lighter than the Phantom 4 Pro and has fewer obstacle avoidance sensors. Phantoms are used for taking photographs and video recordings from the air for the purpose of creating precise 3D digital models of terrain and objects.
Technical specifications	• Mass Phantom 4 Pro / 4 Advanced: 1388 g / 1368 g • Battery: 6000 mAh LiPo (2S) • Maximum speed: 72 km/h • Maximum inclination angle/angular velocity: 42°; 250°/s; • Maximum flight altitude: 6000 m • Resistant to maximum wind speed of 10 m/s • Maximum flight duration: approx. 30 min • Sensor dimensions: 1“ • Sensor resolution: 20 M • Shutter: electronic 1/8000 s, mechanical 1/2000 s • Video resolution: 4K:3840×2160 24/25/30p @100Mbps
Additional information	https://www.dji.com/hr/phantom-4-pro/info
Funding	NP Plitvice Lakes, project „Monitoring of morphological changes of the course of the Korana River (from the third Korana waterfall to Sastavci)“
Contact	Igor Ružić, Ph.D, e-mail: iruzic@gradri.uniri.hr

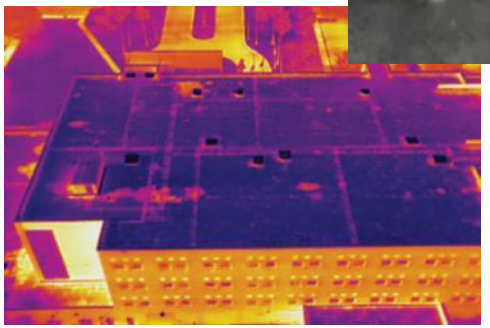
SENSORS AND MEASUREMENT DEVICES

Equipment	**Side scan sonar Humminbird SOLIX 12**
Affiliation	University of Rijeka, Faculty of Maritime Studies
Short description and examples of use	Sonar SOLIX 12 is used for underwater depth measuring and imaging. It consists of a control head unit with 12'' screen and underwater CHIRP transducer. The Sonar can scan the seabed using Down Imaging i.e. creating „portrait“ seabed image below the ship/boat or using Side Scan providing a side-to-side perspective i.e. scans the area to the left and right of the boat location. The sonar can use three frequencies (455 kHz, 800 kHz and 1100 kHz) depending on actual depth. With the sonar and AutoChart program the seabed can be analyzed and live bathymetry charts can be generated. The sonar may be used for: fish detection and size estimation, detection and recognition of different underwater structures (wrecks, reefs, pipelines, etc.), estimation of seabed type and hardness, detection and estimation of seabed vegetation presence, hydrographic measurements, creating bathymetric charts and 3D charts of the scanned area.
Technical specifications	• TFT 12'' screen 1280x800 - NMEA 0183 Bus, NMEA 2000 Bus; Transducer CHIRP MEGA SI+; GPS. • SIDE IMAGING Range - 455 kHz: 244 m; 800 kHz: 76 m; MEGA Imaging+: 122 m, Ranges indicate Side to Side. • SIDE IMAGING Coverage Area - 455 kHz: (2) 86˚; 800 kHz: (2) 55˚; MEGA Imaging+: (2) 86˚. • DOWN IMAGING Depth - 455 kHz: 122 m; 800 kHz: 38 m; MEGA Imaging+: 61 m. • DOWN IMAGING Coverage Area - 455 kHz: 75°; 800 kHz: 45°; MEGA Imaging+: 75°.
Additional information	https://www.humminbird.com
Funding	EU InterReg project AdriREEF
Contact	Lovro Maglić, Ph.D, e-mail: maglic@pfri.hr



Equipment	**Velodyne LiDAR Puck**
Affiliation	University of Rijeka, Faculty of Maritime Studies
Short description and examples of use	Velodyne LiDAR (Light Detection and Ranging) device is based on emitting laser light pulses in the surroundings obtaining distances to the targets by measuring the time of reflection the light takes to return to the sensor. Velodyne LiDAR Puck has a range of 100 m and generating about 300,000-600,000 (not)georeferenced points/seconds in real-time. The result is the capability to create high-quality 3D models of the surroundings (targets). The sensor has 360° horizontal and 30° vertical field of view, providing a wide range and high precision. Velodyne LiDAR Puck can be used as an independent stationary unit, as a mobile unit mounted on a vessel (land or sea) or it can be integrated with the **UAS JAZZ-Octocopter 1100**. Examples of use: area mapping (development of 3D models), object (obstacle) detection on land and/or water in the function of navigation, obstacle avoidance, adaption of movement in accordance with traffic conditions, data postprocessing with various graphical and simulation software.
Technical specifications	• Dimensions/Mass: 103 mm (Diameter), 72 mm (Height); 830 g. • Sensor Measurement Range: ≤ 100 m. • Horizontal/Vertical Sensor field of view: 360°; 30°. • Sensor accuracy: ± 3 cm. • Sensor rotation rate: 5-20 Hz. • Laser (wavelength): 903 nm. • Single/Double Return Mode: ~300.000;~600.000 points/s.
Additional information	https://velodynelidar.com/products/puck/
Funding	University of Rijeka, Faculty of Maritime Studies
Contact	Tomislav Krljan, MSc, e-mail: krljan@pfri.hr Neven Grubišić, Ph.D, e-mail: neven.grubisic@pfri.uniri.hr

Equipment	**Thermal Camera FLIR Duo Pro R**
Affiliation	University of Rijeka, Faculty of Maritime Studies
Short description and examples of use	FLIR Duo Pro R is a specially designed thermal and video camera intended for a wide range of high-performance commercial, industrial and safety applications. Remote connectivity (FLIR UAS mobile application) with FLIR Duo Pro R camera enables precise user settings adjustment, calibrated color panels used on a specific application sites (Indoor/Outdoor, Maritime, Agricultural, Forrest, SAR, etc.). Single and/or Dual mode (IR and/or Visible). FLIR Duo Pro R can be used as an independent stationary unit, as a mobile unit mounted on a vessel (land or sea) or it can be integrated with the UAS JAZZ-Octocopter 1100. Examples of use: the taking high-quality photo and video recordings of fixed and mobile land or sea objects, which can be used for further photo and video analysis.
Technical specifications	• Dimensions/Weight: 85 x 81,3 x 68,5 mm / 325 g • Thermal Lens Options (FOV)/Resolution: 13 mm (45° x 37°) / 640 x 512 px • Thermal Sensitivity: <50 mK / Thermal Frame Rate: 9 Hz • Measurement Accuracy: +/- 5C or 5% (-25°C – +135°C); +/- 20 C or 20% (-40°C – +550°C) • Visible Camera (FOV)/Resolution: 56° x 45° / 4000 x 3000 px • Digital Video Out (Micro-HDMI): 1080p60, 1080p30, 720p60 • Operating Temperature Range: -20° – +50°C • GNSS: GPS, GLONASS • Accelerometer, Gyroscope, Magnetometer, Barometer
Additional information	https://velodynelidar.com/products/puck/
Funding	University of Rijeka, Faculty of Maritime Studies
Contact	Tomislav Krljan, MSc, e-mail: krljan@pfri.hr Neven Grubišić, Ph.D, e-mail: neven.grubisic@pfri.uniri.hr



Equipment	**Portable handheld 3D scanner - Shining 3D EinScan PRO2x**
Affiliation	University of Rijeka, Faculty of Engineering
Short description and examples of use	Handheld 3D scanner, easy to carry and work in the field. The Siemens Solid Edge SHINING 3D Edition software user interface allows the user to quickly scan and process data. Examples of use: scanning of objects and structures, 3D modeling, reverse engineering, generative design, simulations and 3D printing.
Technical specifications	• Scanning methods: fast manual, HD manual, fixed • Speed: up to 1,500,000 dots per second or 30 ftps using fast manual mode and up to 1,100.000 dots per second, i.e. 20 ftps using HD manual mode • Scan range: 312x204mm • Scan accuracy of 0.04 mm in fixed mode • Volumetric accuracy of 0.05mm + 0,3mm/m in HD manual mode with a minimum distance between points of 0.2mm • Alignment methods: feature alignment, reference point alignment, pivot point alignment, manual alignment
Additional information	http://www.riteh.uniri.hr/ustroj/zavodi/zbimt/laboratorij-za-inzenjerstvo-morske-tehnologije-copy-2/
Funding	University of Rijeka, Faculty of Engineering
Contact	Dunja Legović, Ph.D., e-mail: dunja.legovic@riteh.hr

Equipment	**Multi gas detector - Sniffer4D Hyper-local Mobile Air Quality Mapping System**
Affiliation	University of Rijeka, Faculty of Maritime Studies
Short description and examples of use	Sniffer4D Hyper-local Mobile Air Quality Mapping System is a device used for a mobile or stationary measuring of air quality and the chemical compounds concentration and dispersion. The device is equipped with NO_2, CO, SO_2, VOCs, and $PM_{2.5,10}$ electrochemical sensors. The combination of electrochemical sensors can be adjusted according to the individual requirements. The device is equipped with a positioning module enabling georeferenced dataset collection and visualization on interactive maps using Sniffer4DMapper software. Sniffer4D Hyper-local Mobile Air Quality Mapping System can be used as an independent stationary unit, as a mobile unit mounted on a vessel (land or sea) or it can be integrated with the **UAS JAZZ-Octocopter 1100**. Examples of use: measurements of chemical compounds concentration and dispersion of on different heights on land or sea, detection of excessive concentration of chemical compounds, mapping of detected compound concentrations and air quality.
Technical specifications	• Dimensions/Mass: 150x148x50 mm (LxWxH); 350 g. • Sensors (electrochemical): NO_2, CO, SO_2, VOCs, $PM_{2.5,10.}$ • Time resolution: 1 s. • Temperature, humidity, and pressure sensor. • Theoretical resolution: 0.1 °C, 0.1 %, 0.01 kPa. • Communication range (open areas, urban areas): 3-5 km, 1-2 km. • Positioning module (GPS, Beidou, GLONASS) accuracy: ± 2 m. • Data Storage: > 4100 h, 16 GB.
Additional information	https://www.soarability.tech/sniffer4d_software_en
Funding	University of Rijeka, Faculty of Maritime Studies
Contact	Tomislav Krljan, MSc, e-mail: krljan@pfri.hr Neven Grubišić, Ph.D, e-mail: neven.grubisic@pfri.uniri.hr

Equipment	**Portable emission measuring device - Testo 350 Maritime**
Affiliation	University of Rijeka, Faculty of Engineering
Short description and examples of use	The Testo 350 MARITIME portable analyzer is a certified device for measuring the emission of exhaust gases on marine diesel engines and can be used to measure the concentrations of flue gases NO, NO2, SO2, CO, CO2- (IR) and O2. To be able to be used in all conditions at sea, the complete flue gas analyzer, including accessories, is housed in a robust protective housing. The device is approved by the classification society DNV, and communication with the computer takes place via USB. Examples of use: in accordance with NOx Technical Code 2008 can be used for direct measurement and monitoring on board as well as for simplified test and measurement methods, and is also suitable for checking NOx limit values established by the MARPOL Convention, Annex VI.
Technical specifications	• Weight: 17 kg • Dimensions: 565x455x265mm • Operating temperature: from 5 °C to 45 °C • Measuring probes: 1 x combustion air temperature probe; 1 x flue gas probe; 1 x temperature probe; 1 x differential pressure • Pump flow: 1 l/min with flow control • Minimum and maximum pressure: -300 mbar and 50 mbar
Additional information	https://www.testo.com/en/
Funding	Croatian Science Foundation (HRZZ), Project DEcision Support System for green and safE ship RouTing (DESSERT)
Contact	Jasna Prpić-Oršić, Ph.D., e-mail: jasna.prpic-orsic@riteh.hr

Equipment	**Digital cameras with underwater housing: Olympus TG-2 and Olympus TG-6**
Affiliation	University of Rijeka, Faculty of Civil Engineering
Short description and examples of use	The Olympus TG-2 and TG-6 digital cameras are resistant to any weather conditions. They can withstand a fall from a height of 2.1 m, and they can operate at a temperature of -10 ° C. They have the possibility of shooting underwater to a depth of 15 m, and with a protective underwater housing to a depth of 45 m. Both devices are equipped with a 25 mm lens with 4x optical zoom, which provides video recordings with a maximum resolution of up to 3840 × 2160 pixels at 30 fps. The aperture for the TG-2 camera is F2.0 - F4.9 and for the TG-6 it is F2.0 - F8.0. The devices are used for photo and video shooting on land and underwater.
Technical specifications	• Resolution: 12 million pixels • Sensor dimensions: 6.17 x 4.54 mm • Maximum photo resolution: 3968 x 2976 • Lens range: 25 - 100 mm • Optical zoom: 4x • Aperture TG-2: F2.0 – F4.9 • Aperture TG-6: F2.0 – F8.0 • Video recording: YES • Maximum video resolution: 3840x2160 (30 fps/25 fps) • Built-in GPS
Additional information	https://www.imaging-resource.com/PRODS/olympus-tg2/olympus-tg2A.HTM https://www.imaging-resource.com/PRODS/olympus-tg-6/olympus-tg-6A.HTM
Funding	University of Rijeka, Faculty of Civil Engineering
Contact	Igor Ružić, Ph.D, e-mail: iruzic@gradri.uniri.hr

Equipment	**Virtual reality headset - Oculus Rift**
Affiliation	University of Rijeka, Faculty of Engineering
Short description and examples of use	Headset for interactive entry into virtual reality. Soft, comfortable headset with custom optics provide incredible visual fidelity and a wide field of view. Sensors track the constellations of IR LEDs to translate motion into VR. Examples of use: a virtual walk within a model of a ship structure or a real shipyard, port, etc.
Technical specifications	• Panel type: Dual OLED 1080x1200 • Supported refresh rate: 90Hz • Native Color Space: Between Adobe RGB and DCI-P3 gamut, 2.2 gamma, D75 white point • Default SDK Color Space: Same as native color space, linear gamma (or native sRGB) • Display Connector: HDMI 1.3 • USB Connector: minimum 2x USB 3.0. Additional tracking sensors allowed on USB 2 • Tracking: Outside in - 6DOF • Audio: Integrated over-ear headphones and microphone • Lens distance: Adjustable
Additional information	https://www.oculus.com
Funding	University of Rijeka, Faculty of Engineering
Contact	Tin Matulja, Ph.D., e-mail: tin.matulja@riteh.hr

Equipment	**Current profiler - Teledyne Marine SteamPro**
Affiliation	University of Rijeka, Faculty of Civil Engineering
Short description and examples of use	Teledyne Marine SteamPro is an Acoustic Doppler current profiler (ADCP) designed for surface recording of streamflow features in rivers and canals. Based on the Doppler effect, it measures streamflow and velocity in real time sending data wirelessly to a computer. The recording takes only a few minutes and can be done from the shore. The device is equipped with a compass and a bottom tracking sensor with a range of 7 m. Examples of use: defining kinematic and geometric streamflow quantities in shallow rivers and canals.
Technical specifications	• Dimensions (L × W × H): 70 × 42 × 10 cm • Maximum bottom tracking range: 7 m • Maximum geometry measurement range: 6 m • Minimum size of the measuring cell: 2 cm • Measurement of water velocity up to ± 5m/s • Accuracy: ± 1 % of measured velocity ± 0.2 cm/s
Additional information	http://www.teledynemarine.com/streampro?BrandID=16
Funding	Project „Research Infrastructure for Campus-based Laboratories at the University of Rijeka“ (RISK)
Contact	Igor Ružić, Ph.D, e-mail: iruzic@gradri.uniri.hr

Equipment	**Acoustic wave and current profiler - ADCP Nortek SA AWAC 1MHz, four beams**
Affiliation	University of Rijeka, Faculty of Civil Engineering
Short description and examples of use	Nortek SA Acoustic Wave and Current (AWAC) profiler is a device for measuring sea current and waves in real time. It can be used to create sea current profiles and the full wave spectrum. With a maximum range for wave measurements of 35 m and surface recording at a frequency of 4 Hz, AWAC 1 MHz is a great tool for research in shallow areas. Examples of use: preparation of wave studies, coastal erosion studies, monitoring of short-term waves for protection of shore and canals, research of tidal currents, planning and design of new coastal structures and interventions on waterways, planning of safety measures on waterways, etc.

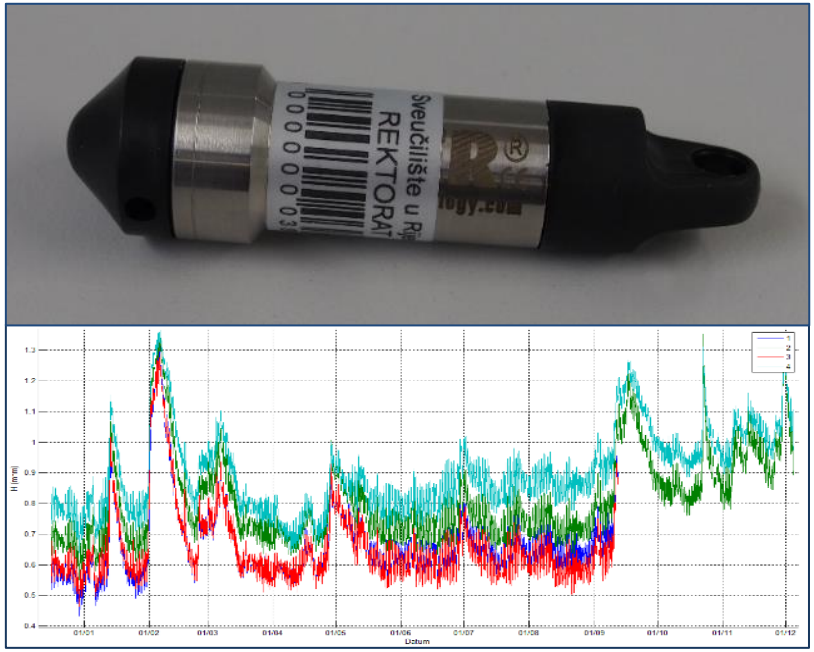
Technical specifications

- Maximum range (waves): 35 m
- Maximum range (currents): 30 m
- Velocity range: ±10 m/s horizontally
- Accuracy: ±1% of measured value ±0.5 cm/s
- Wave range: H = -15 m – 15 m; T = 0.5 s – 50 s
- Precision/resolution <1% of measured value / 1 cm

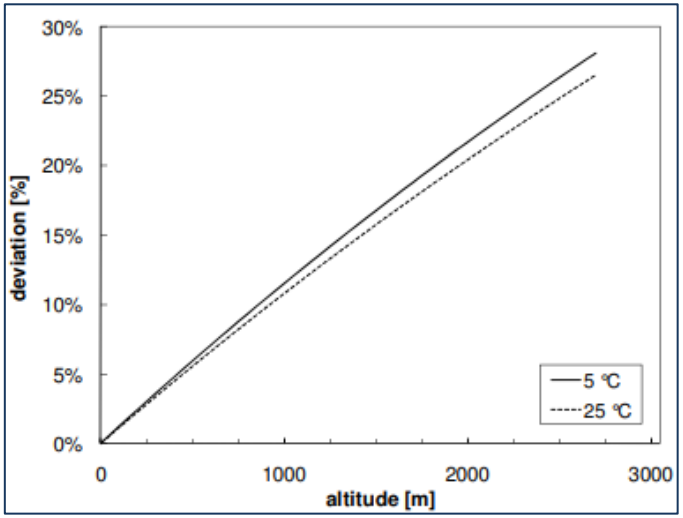
Additional information	https://www.nortekgroup.com/products/awac-1-mhz
Funding	Project „Research Infrastructure for Campus-based Laboratories at the University of Rijeka“ (RISK)
Contact	Igor Ružić, Ph.D, e-mail: iruzic@gradri.uniri.hr

Equipment	**Profiling velocimeter - Nortek AS Vectrino profiler**
Affiliation	University of Rijeka, Faculty of Civil Engineering
Short description and examples of use	Vectrino profiler is a profiling velocimeter measuring 3D velocity in a water column with a sampling rate of up to 100 Hz. The basic measurement technology is a coherent Doppler processing, which is characterized by accurate data at high rates. The measurement defines three components of a velocity vector in the range of 3 cm, with a resolution of 1 mm. At the same time the distance to the bottom can be measured. The device comes with the software whose interface provides the ability to graphically display the velocity profile, standard velocity deviation, energy spectrum, as well as streamlines. Examples of use: primarily intended for laboratory measurements, but proved to be very useful in measuring the swash velocity on the beaches; erosion research (stress and velocities at the bottom), streamflow description and determination of streamflow around structures, wave energy monitoring, turbulence measurement.
Technical specifications	• Measured speed range: in steps from 0.1 m/s to a maximum of 3.0 m/s • Sampling frequency: 1 – 100 Hz • Accuracy: ±1% of measured value ±1 mm/s • Minimum range: 20 mm • Maximum range: up to 2 m
Additional information	http://195.62.126.26/en/products/velocimeters/vectrino-ii
Funding	Project „Research Infrastructure for Campus-based Laboratories at the University of Rijeka“ (RISK)
Contact	Igor Ružić, Ph.D, e-mail: iruzic@gradri.uniri.hr

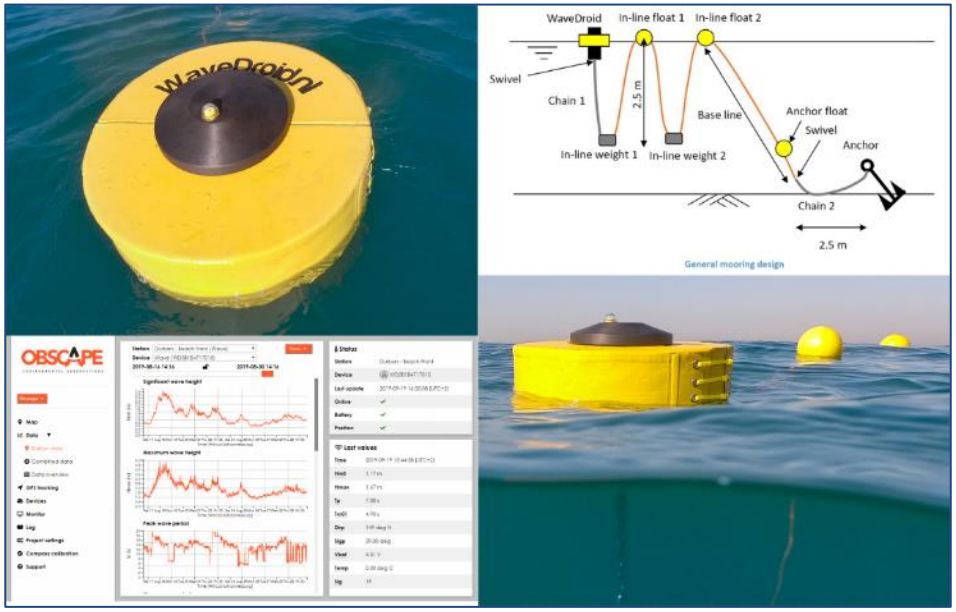
Equipment	**Water level data logger - Mini-Diver 10 m**
Affiliation	University of Rijeka, Faculty of Civil Engineering
Short description and examples of use	Probe with datalogger for measuring conductivity, water level and temperature. In addition to pressure and temperature sensors, the Mini-Diver consists of a memory and battery, all housed in a 22 mm diameter housing made of 316L stainless steel (not suitable for measurements in seawater). The datalogger is autonomous and can be programmed by user. Communication between the Diver and the computer is optical; data transfer and processing are possible through *Diver-Office* software. For measurements, the device uses a pressure sensor when submerged at a fixed level below the water surface. The sensor measures the equivalent hydrostatic pressure of the water column above it (up to a maximum of 10 m) and thus calculates the total water depth. The device measures absolute pressure, so in addition to the water level, it also considers variations in atmospheric pressure at the surface. In addition to the Mini-Diver, Baro-Diver is used to compensate for pressure changes. Baro-diver is a probe for continuous measurement of temperature and air pressure in real time. Usage: measuring water level changes, conductivity and temperature.
Technical specifications	• Dimensions: Ø22 mm, length 90 mm • Maximum measured depth: 10 m • Accuracy: ± 0.5 cm H_2O • Range of measured temperatures: -20 °C – 80 °C • Precision: ± 0.1 °C • Memory capacity: 24 000 readings • Battery life : 8 – 10 years • Sampling time: 0.5 s – 99 h
Additional information	https://www.eijkelkamp-usa.com/products/sensors-monitoring/minidiver-10-meter.htm
Funding	Project „Research Infrastructure for Campus-based Laboratories at the University of Rijeka“ (RISK)
Contact	Igor Ružić, Ph.D, e-mail: iruzic@gradri.uniri.hr



Equipment	**Water level and conductivity data logger - CTD-Diver**
Affiliation	University of Rijeka, Faculty of Civil Engineering
Short description and examples of use	Submersible datalogger for long-term and continuous real time groundwater level monitoring, detection of salt water intrusion and chemical discharges. It measures water temperature and electrical conductivity as well. It is 22 mm in diameter, and the 135 mm long robust ceramic housing is corrosion resistant and suitable for use even in the seawater. It uses a pressure sensor for measurements when submerged at a fixed level below the water surface. The sensor measures the equivalent hydrostatic pressure of the water column above it (up to a maximum of 10 m) and thus calculates the total water depth. The electrical conductivity of water is measured using sensor with 4 electrodes which allow measurement in the range 0 – 120 mS/cm. In addition to the CDT-Diver, Baro-Diver is used to compensate for temperature and pressure changes. Examples of use: measurement of pressure, temperature and electrical conductivity, monitoring of pollution, management of coastal aquifers: monitoring of salt water intrusion, monitoring of estuaries, monitoring of water quality and tide levels.
Technical specifications	• Dimensions: Ø22 mm, length 135 mm • Conductivity measurement: 0 – 120 mS/cm • Conductivity: ± 1% when reading at minimum 1 mS/cm • Maximum measured depth: 10 m • Precision: ±0.5 cm H_2O • Memory capacity: 48 000 readings • Battery life: 8 – 10 years • Sampling time: 1 s – 99 h
Additional information	https://www.vanessen.com/products/data-loggers/ctd-diver/
Funding	Project „Research Infrastructure for Campus-based Laboratories at the University of Rijeka“ (RISK)
Contact	Igor Ružić, Ph.D, e-mail: iruzic@gradri.uniri.hr

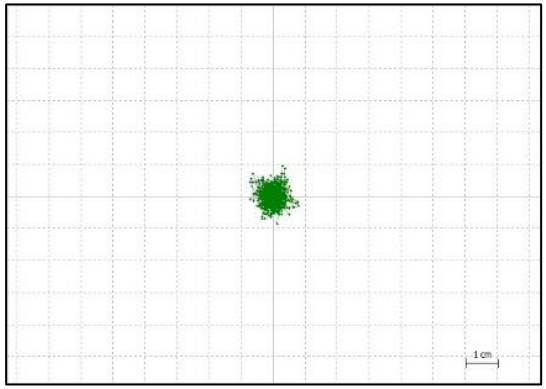


Equipment	**Wave measurement buoy with anchor line**
Affiliation	University of Rijeka, Faculty of Engineering
Short description and examples of use	Measurement buoy for measuring wave parameters with anchor line. It is equipped with motion sensors and an electronic compass for measuring the directional wave field with high accuracy. In this way, a directed wave spectrum and parameters such as one-dimensional energy density spectrum, significant wave height, wave period, wave direction, etc., are obtained. Communication with the buoy via GSM and satellite and via a web application. Examples of use: Measurement of wave parameters (significant height, maximum height, peak period, average period, maximum period, etc.) and estimation of the 1D and 2D (directional) wave spectra (peak wave direction, frequencies of the 1D and 2D spectra, energy density of the 1D spectrum, peak direction per wave frequency of the 2D spectrum). The measurement is performed for the purpose of determining the characteristics of the sea through wave spectra.
Technical specifications	• Wave spectrum: Fully directional • Diagnostic parameters: latitude, longitude, battery voltage, signal strength • Sample frequency: 5.82 Hz • Filtered frequency range: 0.05 Hz – 1.00 Hz (20 s – 1s) • Burst duration: 30 min • Real-time dana interval: 30 min – 24h
Additional information	http://www.wavedroid.nl
Funding	University of Rijeka, Faculty of Engineering
Contact	Jasna Prpić-Oršić, Ph.D., e-mail: jasna.prpic-orsic@riteh.hr



Equipment	**Motion sensors Ellipse-A and Dual GNSS Ellipse-D RTK**
Affiliation	University of Rijeka, Faculty of Engineering
Short description and examples of use	The Ellipse-A motion sensor allows measurement of roll, pitch, heave and heading, but does not have the ability to connect to the GNSS system. On the other hand, the Dual GNSS Ellipse-D RTK motion sensor is an AHRS/INS device with a dual GNSS antenna and a dual-frequency receiver that can also receive RTK correction, enabling centimeter accuracy in position measurement and exceptional accuracy in measuring of heading. In addition to the above, it measures/estimates the orientation of the object in space as well as numerous other navigation parameters. Communication with the computer takes place via RS-232/RS-422 receiver. Examples of use: measurement of heave, pitch, roll and direction of advance of the vessel. It can be used to determine the actual maritime characteristics of a vessel.
Technical specifications	• Dimensions: 46x45x24mm Ellipse-A and 46x45x32mm Ellipse-D • Operating temperature: from -40 °C to 85 °C • Roll/pitch accuracy: Ellipse-A 0.1°, Ellipse-D 0.1° SP, 0.05° RTK and 0.03° PPK • Heading accuracy: Ellipse-A 0.8°, Ellipse-D 0.2° and 0.1° PPK • Velocity accuracy: Ellipse-D 0.03 m/s • Heave accuracy: 5 cm or 5% for both sensors • Heave period: up to 15 s (automatically adjusts to the wave period)
Additional information	https://www.sbg-systems.com/
Funding	Croatian Science Foundation (HRZZ), Project DEcision Support System for green and safE ship RouTing (DESSERT)
Contact	Jasna Prpić-Oršić, Ph.D., e-mail: jasna.prpic-orsic@riteh.hr

Equipment	**GNSS receiver Spectra Precision ProMark™ 700**
Affiliation	University of Rijeka, Faculty of Maritime Studies
Short description and examples of use	This high-accuracy and precision geodetic receiver can be used both as a base station and as a rover. In the independent operating mode, the receiver is equipped with channels that allow tracking of all available L1 and L2 GPS, and GLONASS satellites. In an augmented mode, the receiver is, through the GPRS service, capable to connect with CROPOS reference/base stations, and determine its position with the Real Time Kinematics method. The receiver can reach the sub-centimeter positioning accuracy.
Technical specifications	• Tracking of GPS (L1 i L2) and GLONASS satellite positioning signals • Possibility of RTK networking • Possibility of different archiving formats • Possible transformations between different reference frames • Capacity of 19 hrs of continuous measurements/recordings
Additional information	https://spectrageospatial.com/ https://dotsurveying.com/gps-gnss-systems/spectra-precision-promark-700-rover-t41 https://www.cropos.hr/o-sustavu
Funding	UNIRI project: „ Research into correlation of maritime and transportation elements in maritime traffic: Satellite navigation segment. “
Contact	David Brčić, Ph.D., e-mail: brcic@pfri.hr

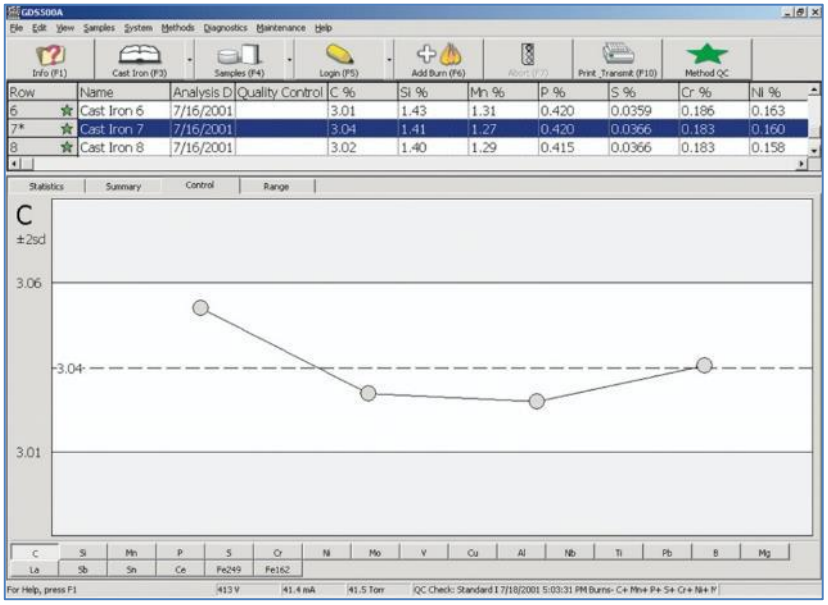


TESTING AND PROCESSING OF MODELS AND MATERIALS

UNIVERSITY OF RIJEKA, FACULTY OF MARITIME STUDIES
Studentska ulica 2, 51000 Rijeka • www.pfri.uniri.hr

Equipment	**Tank with wave generator for model testing**
Affiliation	University of Rijeka, Faculty of Engineering
Short description and examples of use	The tank for model testing is equipped with a custom-made wave generator built by SCAM Marine d.o.o. It is equipped with a wave absorber and sensors for measuring the geometric and kinematic characteristics of the waves. Examples of use: buoyancy and stability of ship models, dynamics of ship models on waves.
Technical specifications	• Length: 5 m • Width: 2,5 m • Height: 1,8 m
Additional information	http://www.riteh.uniri.hr/ustroj/zavodi/zbimt/laboratorij-za-inzenjerstvo-morske-tehnologije-copy-2/
Funding	University of Rijeka, Faculty of Engineering
Contact	Dunja Legović, Ph.D., e-mail: dunja.legovic@riteh.hr

Equipment	**Spectrometer Leco GDS500A**
Affiliation	University of Rijeka, Faculty of Engineering
Short description and examples of use	Device for testing of chemical composition of metals. Examples of use: Determination of chemical composition of low-alloy and high-alloy steels, cast iron, grey cast iron, bronze and aluminum alloys.
Technical specifications	• Spectral range - full wavelength coverage (from 165 nm to 460 nm)
Additional information	https://lecoindia.in/images/pdf/GDS500_209-118.pdf
Funding	UniRi support, Ministry of Science and Education
Contact	Dario Iljkić, Ph.D., e-mail: dario.iljkic@riteh.hr



Equipment	**Universal testing machine Hegewald&Peschke Inspekt Table 20 kN**
Affiliation	University of Rijeka, Faculty of Maritime Studies
Short description and examples of use	Universal testing machine Hegewald&Peschke Inspekt Table 20 kN, intended for testing mechanical properties of materials. Possibility of conducting tensile test with the aim of determining stress-strain diagram, yield point, maximum tensile strength, elastic modulus and deformations of specimen. Machine can be operated by hand using remote control or using software *Labmaster* capable of capturing all aspects of the testing procedure.
Technical specifications	• Max. force: 20 kN • Software Labmaster for performing the tests, collecting, storing and exporting experimental data • Round specimens of diameter 4-10 mm or rectangular specimens of up to 100 thickness accepted • Clip-on extensometer MFA 25 • Load sensor: 20 kN • Traverse speed: 0.0008 - 600 mm/min (at max. load)
Additional information	https://bit.ly/2Q9YcJ6
Funding	University of Rijeka, Faculty of Maritime Studies
Contact	Goran Vizentin, MSc, e-mail: vizentin@pfri.hr Goran Vukelić, PhD, e-mail: gvukelic@pfri.hr

Equipment	**Three-axis CNC milling machine - CNC Router CNC-STEP High-Z S-720**
Affiliation	University of Rijeka, Faculty of Engineering
Short description and examples of use	Three-axis CNC milling machine CNC Router CNC-STEP High-Z S-720 is designed for creating models from solid materials (like foams, wood, plywood). The High-Z CNC machine achieves precision with almost unmeasurable back lash. Programming can be done using SolidCAM or ConstruCAM software tool. It is primarily used to make models for molds or xyz cutting of materials, such as wood, MDF or plywood. Examples of use: engraving, milling, drilling, measuring, cutting as well as gluing adhesive along external 3D contours.
Technical specifications	• Working area of 720 x 400 mm; extended z -axis 300 mm, vacuum table, compressor and housing • Enhanced power and precision using 2 x-axis motors - this arrangement ensures constant tension and compression during milling • Traverse rapid feed up to 4000 mm/min • Resolution: 0.003 mm • Ability to program using SolidCAM or ConstruCAM software tool
Additional information	https://www.cnc-step.com/
Funding	University of Rijeka, Faculty of Engineering
Contact	Davor Bolf, e-mail: davor.bolf@riteh.hr

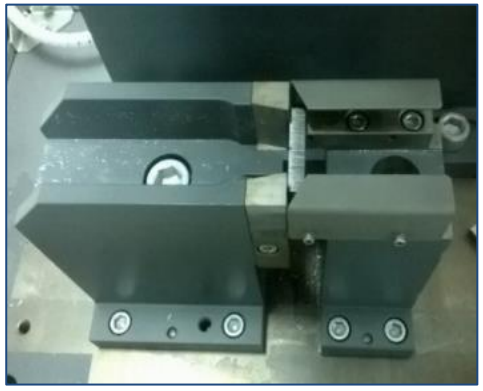
Equipment	**Laser cutting and engraving machine - SNOP LG900**
Affiliation	University of Rijeka, Faculty of Engineering
Short description and examples of use	The SNOP LG900 laser cutting and engraving machine with the associated computer can be used for both cutting and engraving. It uses laser technology to engrave and cut patterns. The 750x500mm working area is covered with a protective cover which ensures safe handling. A computer with the corresponding software is provided for processing input files. Examples of use: cutting and engraving the wood and plastic materials up to 5 mm thick, extremely suitable for making parts for a model, mold or mock-up as well as parts for scaled models made of thin wood, plywood or plastic.
Technical specifications	• Working area: 750 x 500 mm • Cutting and engraving various kind of plastic and wood materials (up to the thickness of 5mm) • Input - DXF file
Additional information	/
Funding	University of Rijeka, Faculty of Engineering
Contact	Davor Bolf, e-mail: davor.bolf@riteh.hr

Equipment	**Laboratory muffle furnace - Nabertherm LV 9/11**
Affiliation	University of Rijeka, Faculty of Engineering
Short description and examples of use	Laboratory muffle furnace Nabertherm LV 9/11 with a control unit is intended for incineration of composite materials. It reaches maximum temperatures up to 1100 ° C. The interior of the furnace is insulated, with dimensions of 230x240x170mm, and it is suitable for burning and heating materials in specially adapted porcelain dishes. A special system of fresh and exhaust air ensures air exchange 6 times a minute, so there is always enough oxygen for the ashing process. Examples of use: it is used for all types of heating, and can be used for post-curing composite materials, as well as burning composite laminates to determine the mass fraction of fibers according to ASTM 2584 standard, determining loss on ignition, ashing food and plastics for subsequent substance analysis.
Technical specifications	• External dimensions 480 x 550 x 900mm • Internal dimensions 230x240x170mm • Power 3.3kW, 220-240V 1/N/PE, 2PE • Maximum temperature 1100°C • Posibillity of pre-programing of 20 heating segments • Controller B410 (5 programs)
Additional information	https://www.nabertherm.com
Funding	University of Rijeka, Faculty of Engineering
Contact	Davor Bolf, e-mail: davor.bolf@riteh.hr

Equipment	**Materials testing machine Zwick/Roell Z400**
Affiliation	University of Rijeka, Faculty of Engineering
Short description and examples of use	Universal testing machines for static and quasi-static stress in tensile, compression and bending tests (3pt bending). Examples of use: tensile testing of metallic materials at different temperatures.
Technical specifications	• Nominal forces: up to 400 kN. • Temperature range: 20° to 900°C (for tensile testing only)
Additional information	http://www.riteh.uniri.hr/ustroj/zavodi/ztm/laboratoriji/laboratorij-za-ispitivanje-cvrstoce-konstrukcija/
Funding	University of Rijeka, Faculty of Engineering
Contact	Goran Turkalj, Ph.D., e-mail: goran.turkalj@riteh.hr

Equipment	**Servopulser Shimadzu EHF-EV050K3-A20-0A**
Affiliation	University of Rijeka, Faculty of Engineering
Short description and examples of use	Fatigue and quasi-static testing equipment. Examples of use: determination of S-N curves and fatigue strength of metallic materials.
Technical specifications	• Maximum cycling load: ±50 kN. • Maximum static load: 60 kN.
Additional information	http://www.riteh.uniri.hr/ustroj/zavodi/ztm/laboratoriji/laboratorij-za-dinamicku-izdrzljivost-konstrukcija/
Funding	University of Rijeka, Faculty of Engineering
Contact	Goran Turkalj, Ph.D., e-mail: goran.turkalj@riteh.hr

Equipment	**Pendulum impact testing machine Zwick/Roell 300J**
Affiliation	University of Rijeka, Faculty of Engineering
Short description and examples of use	Charpy pendulum impact tester. Examples of use: investigation of the specimen behavior under impact conditions at different temperatures.
Technical specifications	• Impact energy: up to 300 J. • Temperature range: –90° to 20°C
Additional information	http://www.riteh.uniri.hr/ustroj/zavodi/ztm/laboratoriji/laboratorij-za-dinamicku-izdrzljivost-konstrukcija /
Funding	University of Rijeka, Faculty of Engineering
Contact	Goran Turkalj, Ph.D., e-mail: goran.turkalj@riteh.hr



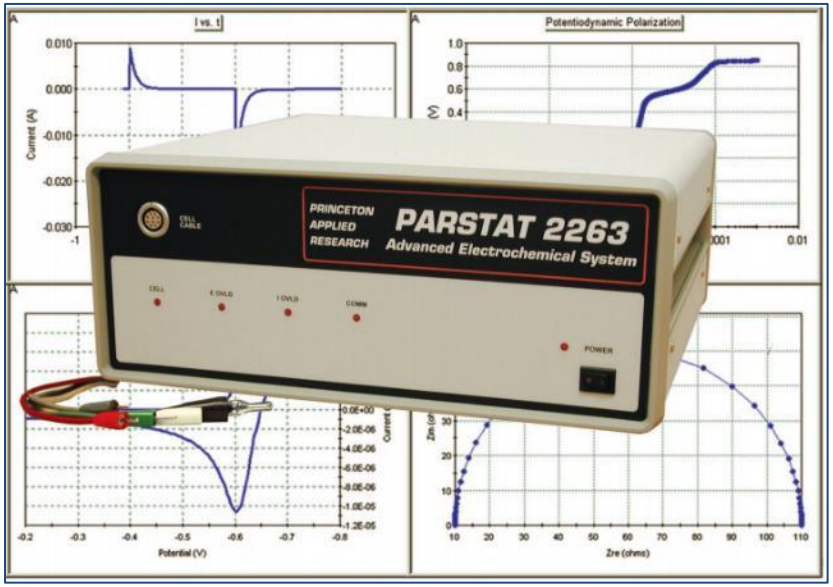
Equipment	**Set of equipment for non-destructive material testing**
Affiliation	University of Rijeka, Faculty of Maritime Studies
Short description and examples of use	Set for non-destructive testing: visual testing, penetrant testing, ultrasound testing, leak testing. Detecting of surface and beneath-the-surface defects of the material, measurement of thickness with and without paint layer, leak testing of pipelines and pressure vessels.
Technical specifications	• Video borescope for visual testing PeakTech 5600, flexible camera diameter 8.2 mm, view angle 60°, autofocus from 30 mm, LED illumination, TFT color display, photo and video recording • Penetrant set Tiede: penetrant PWL-1, developer DL-20, cleaner RL-50 • Ultrasonic thickness gauge Sonatest T-Gage VDLW, transducer DK718EE 7,5 MHz for steels with a thickness of 1-38 mm, A/B scan, Echo-to-Echo function, datalogger, thickness measurement with and without paint layer • Hand pressure testing pump Rems Push for testing pressure and leakage in pipelines and pressure vessels, pressure up to 60 bar, fluid temperature up to 60°C, fluid viscosity up to 1.5 mPa·s, pressure gauge 0-60 bar cl. 1,0
Additional information	https://bit.ly/2QlgjLX https://bit.ly/2P4mJOZ https://bit.ly/2QISBJi
Funding	UNIRI projects: “Numerical modelling of crack occurrence and propagation”, “Failure analysis of materials in marine environment”
Contact	Goran Vizentin, MSc, e-mail: vizentin@pfri.hr Goran Vukelić, PhD, e-mail: gvukelic@pfri.hr

Equipment	**Portable digital liquid density meter - Anton Paar DMA 35**
Affiliation	University of Rijeka, Faculty of Engineering
Short description and examples of use	Portable digital meter for density, temperature and concentration of liquids, easy to carry and work in the field where the measurement is performed at the sampling point with a hand pump, so there is no need to transfer to the laboratory. Examples of use: checking the quality of liquids in the field, e.g. monitoring fermentation, measuring the density or concentration of preservatives, measuring the concentration of acids in the etching process in electronics production, measuring the density of coatings and refrigerant concentrations, etc.
Technical specifications	• Measurement principle: oscillating U-tube made of borosilicate glass • Measurement range: density from 0 g/cm^3 to 3 g/cm^3; temperature from 0 °C to 100 °C • Accuracy: density 0.001 g/cm3; temperature 0.2 °C • Dimensions (L x W x H): 245 mm x 103 mm x 126 mm • Weight: 660 g • Sample volume: 2ml • Interfaces: Bluetooth, RFID
Additional information	https://www.anton-paar.com/corp-en/products/details/dma-35/
Funding	University of Rijeka, Faculty of Engineering
Contact	Roko Dejhalla, Ph.D., e-mail: roko.dejhalla@riteh.hr

Equipment	**Ultrasonic flaw detector - Avenger EZ-AWS**
Affiliation	University of Rijeka, Faculty of Engineering
Short description and examples of use	The Avenger EZ-AWS is a rugged, lightweight, handheld ultrasonic flaw detector of sub-surface defects in any solid material, and offers a range of material thickness measurement options. It is intended for periodic inspections, but also for daily use in production as well as laboratory tests. Examples of use: detection of cracks and irregularities in the ship's structure and equipment regardless of the construction material (steel, aluminum, fiberglass, carbon fiber, etc.). The Avenger is designed to perform in all types of indoor and outdoor environments.
Technical specifications	• Display: Super Twist LCD, 3.9" 240x320, transflective; backlit, contrast adjustable, battery status and mode icons, large thickness/soundpath display. Hollow or filled waveform, reversed field selectable. • Range: 340 Inches • Velocity: 0.0500 to 0.9999 inch per microsecond • Resolution: 0.0001 or 0.001 inch (0.01mm) • Stored settings: 100 user-defined settings • Input/Output: USB via Optional Cable and Data Transfer Software • Units: Inches or millimeters • Size 3.5"W x 7.5"L x 1.6"D • Weight: 0.6 kg
Additional information	https://www.ndtsystems.com/
Funding	University of Rijeka, Faculty of Engineering
Contact	Tin Matulja, Ph.D., e-mail: tin.matulja@riteh.hr

Equipment	**Extensometer - Epsilon Technology model 3421-050M-ST**
Affiliation	University of Rijeka, Faculty of Engineering
Short description and examples of use	The extensometer is designed for measuring the displacement and shear modulus of the core in sandwich laminates. It can be attached via clip mechanism, which allows the extensometer to be easily attached to the steel plates of the sample, without any additional means of prevention from falling or detaching. Examples of use: displacement measurement in compression and tensile mode up to +/- 5 mm of displacement. With adequate protection of the sample from separation in the direction of thickness, it can also be used in cases up to complete fracture of the sample (if sample is protected from falling apart). It is specially designed for samples and measurements according to ASTM C273, ASTM C394, ISO1922, DIN 53294, EN 12090 standards in laboratory conditions.
Technical specifications	• Accuracy: <= 0.003 mm for displacements < 0.3 mm; <=1,0% for displacements >= 0.3 mm • Sample dimensions: thickness 20-75 mm (core + steel plates), width min 40mm, optimum 50-150 mm • Temperature range from -40°C up to 100°C • Measuring range +/- 5mm • Integrated signal cord up to 2.5 m in length
Additional information	https://www.epsilontech.com/wp-content/uploads/product-specs/3421.pdf
Funding	University of Rijeka, Faculty of Engineering
Contact	Davor Bolf, e-mail: davor.bolf@riteh.hr

Equipment	**Potentiostat - Parstat 2263**
Affiliation	University of Rijeka, Faculty of Engineering
Short description and examples of use	Device for electrochemical corrosion testing. Examples of use: main purpose of this device is for conducting electrochemical corrosion tests. With its technical specifications and compact size, it is able to perform virtually all the techniques necessary to evaluate a variety of materials. The built-in impedance circuitry allows for very fast data acquisition during EIS measurements. The examination of coatings performance can be easily addressed.
Technical specifications	• Scanning range of +10 V, 200 mA current capability, EIS measurements up to 1 MHz • DC power supply (12V) • Can be operated with an AC/DC or with a DC power supply for remote/field applications • USB interface
Additional information	http://www.speciation.net/Database/Instruments/Princeton-Applied-Research/PARSTAT-2263-;i110
Funding	University of Rijeka, Faculty of Engineering
Contact	Sunčana Smokvina Hanza, Ph.D., e-mail: suncana@riteh.hr



Equipment	**Set of equipment for testing of coatings - Elcometer**
Affiliation	University of Rijeka, Faculty of Engineering
Short description and examples of use	Set of equipment for testing of coatings which includes: Elcometer 107, Elcometer 138, Elcometer 224, Elcometer 270, Elcometer 456, Elcometer 480, Elcometer 510, Elcometer 1615. Examples of use: testing of coating porosity (pinhole detection), coating gloss measurement, evaluation of resistance of coating to impact, adhesion of a coating (cross cut test), non destructive measurement of coating thickness, surface profile measurement of flat and curved surfaces, measurement of the level of contaminants on a surface prior to application of coating, automatic pull-off adhesion test.
Technical specifications	• Elcometer 107 - Cross hatch cutter • Elcometer 138 - Bresle salt kit • Elcometer 224 - Digital surface profile gauge • Elcometer 270 - Pinhole detector • Elcometer 456 - Coating thickness gauge • Elcometer 480 - Glossmeter • Elcometer 510 - Automatic pull-off adhesion gauge • Elcometer 1615 - Variable impact tester
Additional information	https://www.elcometer.com/en
Funding	University of Rijeka, Faculty of Engineering
Contact	Sunčana Smokvina Hanza, Ph.D., e-mail: suncana@riteh.hr

Equipment	**Ultrasonic leak detector - Whisper**
Affiliation	University of Rijeka, Faculty of Engineering
Short description and examples of use	The leak detector includes a specialized built-in receiver that detects frequencies in the 40.5 kHz range. Through sophisticated circuitry, Whisper locates the ultrasound's source, while an internal noise control ensures the instrument is unaffected by audible noise. This makes Whisper a versatile tool which can even be used in noisy environments, such as mechanical rooms. Whisper incorporates heterodyne capability, which reduces the ultrasonic frequencies detected to a range that can be heard by the human ear. Variations can therefore be identified to easily pinpoint the ultrasonic source. Heterodyne output is enabled when headphones are plugged in to the detector. Sensitivity is adjusted through an innovative touch pad. Multiple LEDs and an audible alarm register the leak when heterodyne mode is not enabled. Examples of use: detecting and locating ultrasonic frequencies generated when the following common situations occur: leaks of any gas under pressure or vacuum, electrical arcing, worn bearings and machinery, malfunctions in steam traps, leaking seals.
Technical specifications	• Controls: power button, sensitivity touch pad • Power source: (2) "D" alkaline batteries • Battery life: 165 hours (laser pointer off), 115 hours (laser pointer on) • Weight with batteries: 482 g
Additional information	https://www.inficon.com/en/products/whisper-ultrasonic-leak-detector
Funding	University of Rijeka, Faculty of Engineering
Contact	Tin Matulja, Ph.D., e-mail: tin.matulja@riteh.hr

Equipment	**Ferrite meter - Diverse Technologies MF300Fe+**
Affiliation	University of Rijeka, Faculty of Engineering
Short description and examples of use	Device for measurement of the Ferrite number (FN) of austenitic and duplex stainless steel. Examples of use: Non-destructive testing of the ferrite content in a range of 0.1 to 115FN equivalent to 0.1 to 83% Fe in austenitic & duplex steel.
Technical specifications	• Robust and portable • Standard or peak measurement of Ferrite Number • Piecewise estimate of ferrite percentage • Automatic zero on demand • Supplied with 5 transfer standards allowing veracity of instrument to be checked • Storage of 1000 measurements, downloaded to PC with RS232/USB option
Additional information	https://diverse-technologies.net/ferrite-meter-mf300fe/
Funding	University of Rijeka, Faculty of Engineering
Contact	Dario Iljkić, Ph.D., e-mail: dario.iljkic@riteh.hr

Equipment	**Advanced Process Welder - Power Wave s350**
Affiliation	University of Rijeka, Faculty of Engineering
Short description and examples of use	The multi-process Power Wave S350 enables welding with all common arc welding processes (Stick, GMAW, GMAW-P, GTAW, STT) and automatic robotic welding. It provides an extremely fast arc response, includes over 65 standard welding waveforms for optimized performance on almost any application and efficiently converts input power to reduce operational costs – all in a compact, rugged case. It is equipped with Power Wave Advanced Module enabling alternating current (AC), high frequency GTAW and STT welding processes. Automatically adjusts to input power from 200-600V, 50 or 60 Hz, single phase or three phase. Welding output remains constant through the entire input voltage range. Examples of use: broad spectrum of welding applications performed on different base materials.
Technical specifications	• Dimensions (H x W x L): 518 mm x 356 mm x 630 mm • Weight: 38.556 kg • Welding processes: Stick, GMAW, GMAW-P, AC/DC GTAW, STT • Input Phase: 1/3 • Output range: 5-350 A DC • Data technologies: Ethernet • Communication technology: ArcLink • Feeder supply voltage: 40 V DC • Type of connection for the working cable: Tweco
Additional information	https://www.lincolnelectric.com/en/products/K2823-3?
Funding	University of Rijeka, Faculty of Engineering
Contact	Duško Pavletić, Ph.D., e-mail: dusko-pavletic@riteh.hr

BOATS

Equipment	**Boat Dumi MH 650**
Affiliation	University of Rijeka, Faculty of Maritime Studies
Short description and examples of use	Dumi MH 650 is a fast rescue boat built and equipped with all gear for the implementation of *Proficiency in Fast Rescue Boats Operation* training program according to STCW Convention. The boat is equipped with an outboard engine Suzuki 90 hp and reaches a speed of 25 knots. Apart from the training for professional seafarers, the boat used for different practical purposes – conducting research or transporting people and research equipment to the desired location. The boat's console is adapted to use side scan sonar Humminbird Solix 12. The boat is practical for mounting various research equipment.

Technical specifications

- Length overall: 6.50 m
- Width: 2.50 m
- Height: 1.96 m
- Engine: outboard Suzuki DF90 ATL 66 kW (90 hp)
- Speed: 25 kn
- Construction material: GRP and Hypalon
- Maximum number of passengers: 6

Additional information	N/A
Funding	University of Rijeka, Faculty of Maritime Studies
Contact	Lovro Maglić, Ph.D, e-mail: maglic@pfri.hr Vlado Frančić, Ph.D, e-mail: francic@pfri.hr

Equipment	**Boat Whaly 435**
Affiliation	University of Rijeka, Faculty of Civil Engineering
Short description and examples of use	Whaly 435 is a boat made of a high-quality and resistant plastic material - polyethylene. Thanks to the durable material, this boat is very robust requiring simple maintenance. Considering high wear resistance and given length over all, it is open, spacious and very practical for transporting a variety of equipment on short distances. The boat is also practical for mounting various measuring equipment on both sides which have reinforced rubber elements. The boat is equipped with an outboard engine Suzuki DF30AL of 30 hp (the maximum allowable engine power for the boat). This is a four-stroke engine with 3 cylinders, 490 cm^3 of volume, weighing only 62 kg. The boat is used for different practical purposes – conducting research or transporting people / divers and research equipment to the desired location.
Technical specifications	• Length overall: 4.35 m • Width: 1.73 m • Draft: 0.52 m • Mass without engine: 186 kg • Maximum load capacity: 690 kg with engine • Engine: outboard Suzuki DF30AL 30 hp • Maximum engine power: 30 KS
Additional information	Boat: https://www.whaly.com/en/whaly_4351.html Engine: http://www.suzukikuwait.com/marine/df30al/detail
Funding	Project „Research Infrastructure for Campus-based Laboratories at the University of Rijeka“ (RISK)
Contact	Igor Ružić, Ph.D, e-mail: iruzic@gradri.uniri.hr

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