Infrastructure name	**AUV SEAL**
Code	AUV Seal
Owner/Institution	MARUM (Center for Marine Environmental Sciences), University Bremen
Manager	Gerrit Meinecke (gmeinecke@marum.de)
Equipment type	5000m depth rated AUV
System description	EXPLORER 5000
WEB LINK	http://www.marum.de/en/AUV_MARUM-SEAL.html
WEB LINK TECH SPECS	http://www.marum.de/en/B-Seal_specification_2.html http://www.marum.de/en/Page7835.html
Vessels normally used	Meteor, Poseidon, Maria S. Merian, Le Suroit
Ship requirements	The vehicle has a footprint of 2x6m including the cradle. It needs to placed below the A-frame or crane supposed to deploy the vehicle. The Control container (20' ISO container) can be placed on the working deck near the AUV. The Transport container can also be placed on the working deck as a storage for spare parts but it can also be placed in a storage place. A small Rack (80cm wide, 1m deep, 40cm high) with the power supplys to charge the AUV must be placed within a distance of 12m to the AUV.
Launching method	A-frame or crane
Technical requirements	
Weight	1300kg (in air)
Buoyancy (water)	
Dimensions	5.5m length x 0.74m height
Battery	
Technology	Li-Ion batteries, 14 modules of 1 kWh each
Charging time	
Battery autonomy (e.g. X hrs @ X knots)	19 hours and 100km range @ 3 knots based on ~ 15kWh
Battery capacity	
Dives	
Misson depth	5000m
Duration	> 19 hours (with standard payload)
Speed	0.25 - 2.4 m/s; operating speed 1.5m/s
Max. range	> 100km (with standard payload)

Details of Autonomy/settings in emergency mode (if available)	The emergency system consists of different measures related to the level of emergency. The bottom avoid routine is carried out when the vehicle reaches the minimal navigation altitude. The vehicle tries to pitch up to stay above the minimal navigation altitude. The vehicle will stop the current mission If this does not take effect and the vehicle reaches a critical altitude. The vehicle will react with a release of the drop wheight in case of a short cut on the main Power bus or other critical failures. The drop wheight mechanism can also be triggered by the operator via the acoustic link even if the main power supply is dead. There is one optical flasher (Benthos) and a radio beacon (Benthos) installed. They have a dedicated battery and are activated when the AUV is on the surface. The vehicle will report its Position via Iridium Satellite when on the surface.
Power	The control container needs a power supply of 400VAC 50Hz 32A
Frequency	The AUV Charger needs a power supply of 240V 50Hz 4kW
Voltage	
KVA	
Max Amps	
Other power requirements	
Hydraulic - for LARS (?)	n/a
Pressure	
Flow rate	
Compressed air requirements	
Cooling water	
Subsea positioning requirements (AUV Navigation)	IXSEA PHINS Inertial System; DGPS; RDI 300kHz Doppler Log; Obstacle avoidance sonar (Kongsberg 1007 series); Depth Sensor (Paraoscientific Digiquartz)
Vessel GPS Feed or other requirements	
Communication requirements	
Acoustic	A Sercel Orca Modem is used to exchange information with the AUV while it is submerged. The operator gets the status of the mission, speed, heading and position of the AUV. The operator can also abroad the mission, release the drop wheight or start another section of the programmed mission via the acoustic link.
Acoustic	Posidonia / Gaps Beacon: The Beacon will be triggered by the ship borne Posidonia / Gaps system.
WIFI/Radio Link	2.4GHz Radio Link: The vehicle can also be accessed via the Radio link. The purpose of this link is the control of the AUV during launch and recovery. The operator can switch on all sensors, perform all necessary test before starting the mission. The operator will pilot the vehicle manually to the starting point of the mission and will bring the vehicle back to the ship for the recovery. The amount of traffic is limited on this link, all data retrieval or remote desktop operations should use the Deck cable link.

Deck Cable	Deck Lan cable - The user has access to the recorded Data and the whole vehicle via the deck cable (100MBit/s LAN). The whole system can be controlled and all payload computers like the RESON IPC or the payload computer for the Sidescan and the Sub-Bottom Profiler can be accessed. The user has also full access to all interfaces of all sensors like GPS, CTD, Main battery modules etc. for tests and configuration of the sensors.
Vessel Networking requirements	
No. of System configurations possible	
Configuration 1	
Configuration 2	
Deck Layout Drawing	
Configuration 1	
Configuration 2	
System weight/COG in each configuration	
Configuration 1	
Configuration 2	
Number of containers/Items, Footprint Area required	
Configuration 1	The AUV comes with two 20 ft. containers. The one is used for the transport of the vehicle, spare parts and consumables. The second container contains the control computers for the AUV operation including different radio links and a mission planning computer. A work bench and tools as well as a set of spare parts and consumables are available in the control container.
Configuration 2	
Deck securing arrangements	
Configuration 1	
Configuration 2	
Deck strength/Deck loading	
Configuration 1	
Configuration 2	
Transportation requirements (total weight and number of loads)	
Configuration 1	
Configuration 2	
V.A.T. + Customs clearance practice	
Mobilisation Details	
Typical Mobilisation duration	
Typical Mobilisation cost	
Typical Demobilisation duration	
Typical Demobilisation cost	
Insurance arrangements	
Own use	
Barter	
Charter	
Co-operation	
Transporation insurance	
Technicians	

Number and type of technicians required to operate system in various scenarios	The AUV will be controlled by two people during the dive. The two operators are watching the AUV behavior and control the AUV position via Posidonia. They will inform the ships bridge about the current mission status and the next manoeuvre planned. There will be one member of the AUV team on deck to coordinate the activities during launch and recovery. A rubber boat with two or three people is needed for the recovery of the AUV to hook the recovery gear onto the AUV.
System payloads	
Total maximum payload (kg)	
Existing specific payloads	The standard paylod is the RESON 7125-B Multibeam Sonar. It works at 400kHz with up to 512 beams.
Additional payloads	SeaBird SBE49 CTD; WetLabs FLNTURTD Fluorometer and Turbidity sensor;- IXSEA Echoes 5000 AUV Sub Bottom Profiler; Benthos Dual Frequency Sidescan Sonar (SIS 1624)