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Powered Cable Reel for DataXplorer™

Requirements Document

REACH SYSTEMS, INC.

<https://www.reach-systems.com/>

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1. Overview

Open Ocean Robotics ("OOR") produces the uncrewed surface vehicle (USV) DataXplorer™ designed for autonomous oceanographic data acquisition. OOR is interested in deploying tethered payloads from the USV necessitating the integration of a powered cable reel to the vehicle.

Reach Systems, Inc ("Reach") proposes to design and supply a customized version of their standard cable reel that includes the capabilities described herein.

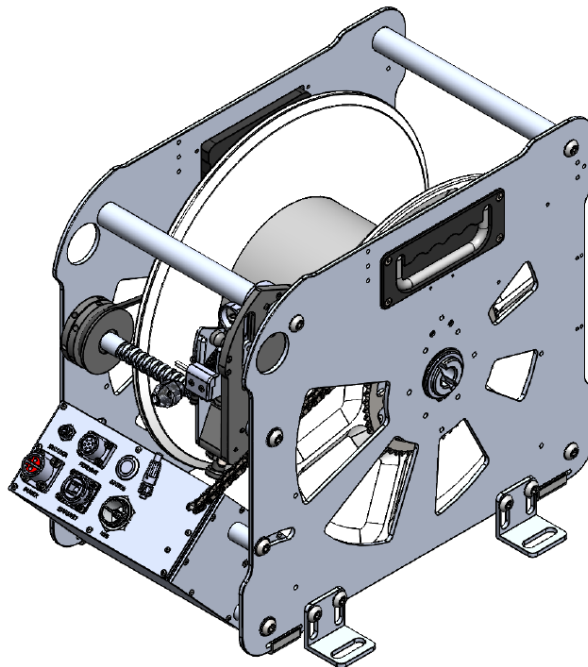


Figure 1: Motorized Croc Mini with Level Wind

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2. Specifications

Envelope	
Length (bow to stern)	≤ 56 cm
Width (along the beam)	≤ 32 cm
Height	≤ 45 cm
Weight (lbs/kg)	21 kg (including 7 kg of tether {100m})
Payload weight	Estimated at under 3Kg
Working Environment	IP67 0° / 40° C
Input Power	12VDC, 150W continuous (300w peak)
On-Board Electronics	Semi-autonomous Ethernet or serial comms to existing on-board systems
Telemetry	Reel status and deployed tether length to be available to the controlling system
Tether	8 conductor (Cat5e) tether cable (7.5mm OD) Terminated with MCOM8F 8-pin female connector
Tether length	Up to 100m of Ø7.50mm tether
Pulling force	175N (39 Lbf) (Empty Drum)
Braking force	To withstand towing speeds up to 5 knots; estimated at 20 lbs
Winding speed	≥ 0.25 m/s
System Voltage	12Vdc (24Vdc possible in future)

3. Requirements

3.1. Dimensions & weight

To optimize the performance of the DataXplorer™, the Croc Mini dimensions and weight will be minimized as much as possible. Components meant for manual operation (handles, etc.) will not be present in pursue of weight reduction.

3.2. Environmental

The reel will be designed for operation in an IP67 environment.

It will certainly be exposed to sea water splashing and would be totally immersed for a few seconds, in the event of a capsized.

3.3. Winding Power

The reel will be run by an electrical motor. The motor will grant:

- Up to 26 rpm of the drum
- Up to 16 Nm continuous Torque (175N (~39 lbf) pull force / payload when the drum is empty

The reel will support different payloads typical of a remotely operated marine system, including a subsea camera, hydrophone, SVP or CTD.

The unit will be able to wind tether at speeds of up to 0.25m/s (empty drum)

3.4. Controls

The reel will be commanded by the USV's on board systems, which may or may not be under the control of a remote operator.

The reel's control system should be semi- autonomous – able to carry out winding and braking commands without operator intervention.

The reel will have a web-based interface as well as an API for all its main functions.

3.4.1. Standard controls

- Set speed
- Unwind
- Wind
- Read depth (tether distance*)
- Set depth (tether distance*)
- Hold position (brake)
- Go to depth (tether distance*)

*tether distance is defined as “estimated wire out”, where ‘estimated’ can be as much as $\pm 5\%$

3.5. Braking system

The active braking system will be motor-based, where the motor will operate in a closed loop to hold (and correct if necessary) within a small range around the desired position.

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The brake's hold force will be similar to the motor's winding capacity.

3.6. Level Wind

The reel will be provided with a mechanical level wind that will operate automatically when the drum turns.

3.7. Cable Counter

A cable counter will be integrated into the Level Wind shuttle to count tether in/out and provide feedback for closed loop functionalities and for visibility of the user.

3.8. Tether and deck cable

The tether provided will be 100m long, terminated with a subsea MCIL8F 8-pin female connector.

There reel will have a bulkhead RJ45 connector for the connection of a deck cable.

The pinout will be agreed with OOR in advance.

3.9. Failure Mode Considerations

The reel controller will have limited fault detection and reporting capabilities.

Further handling techniques can be developed by OOR and integrated to the on-board control unit to handle the reel through its API.

3.10. Mounting

The reel shall be mounted to the ASV deck in a location to be agreed upon by Reach and OOR.

Mounting brackets will be provided to secure the unit to the USV's deck.

3.11. Connectivity

The unit will be connected to the USV through wired ethernet.

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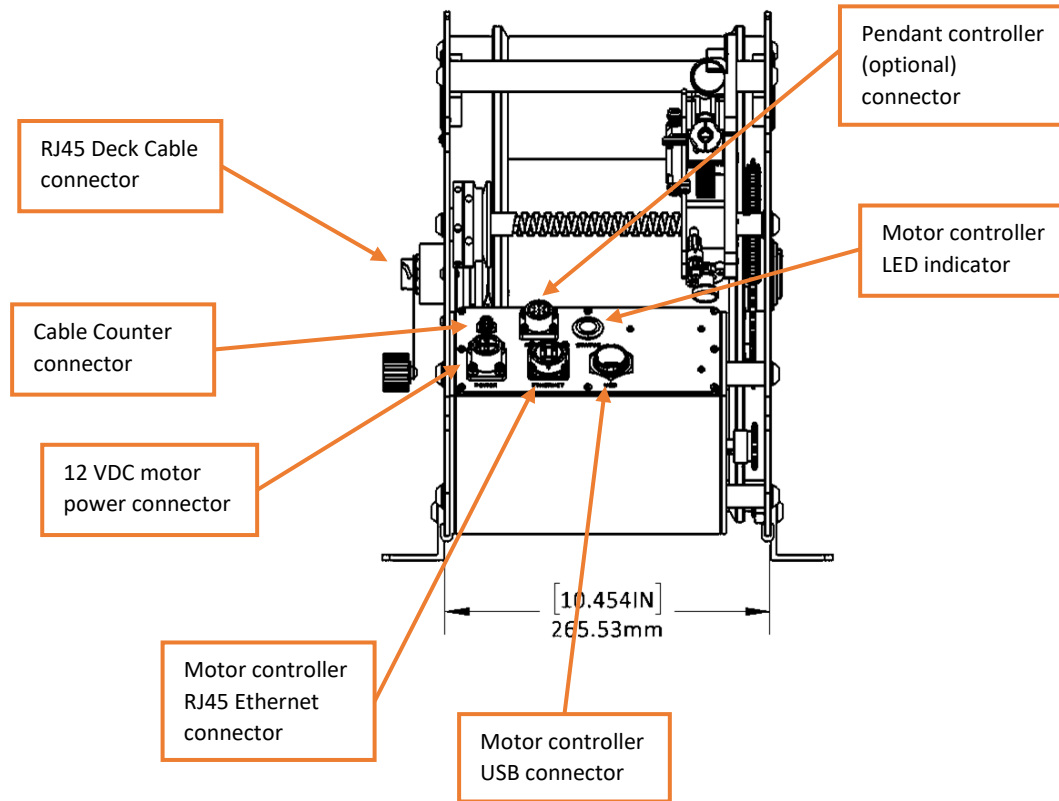


Figure 2: Connections of Motorized Croc Mini