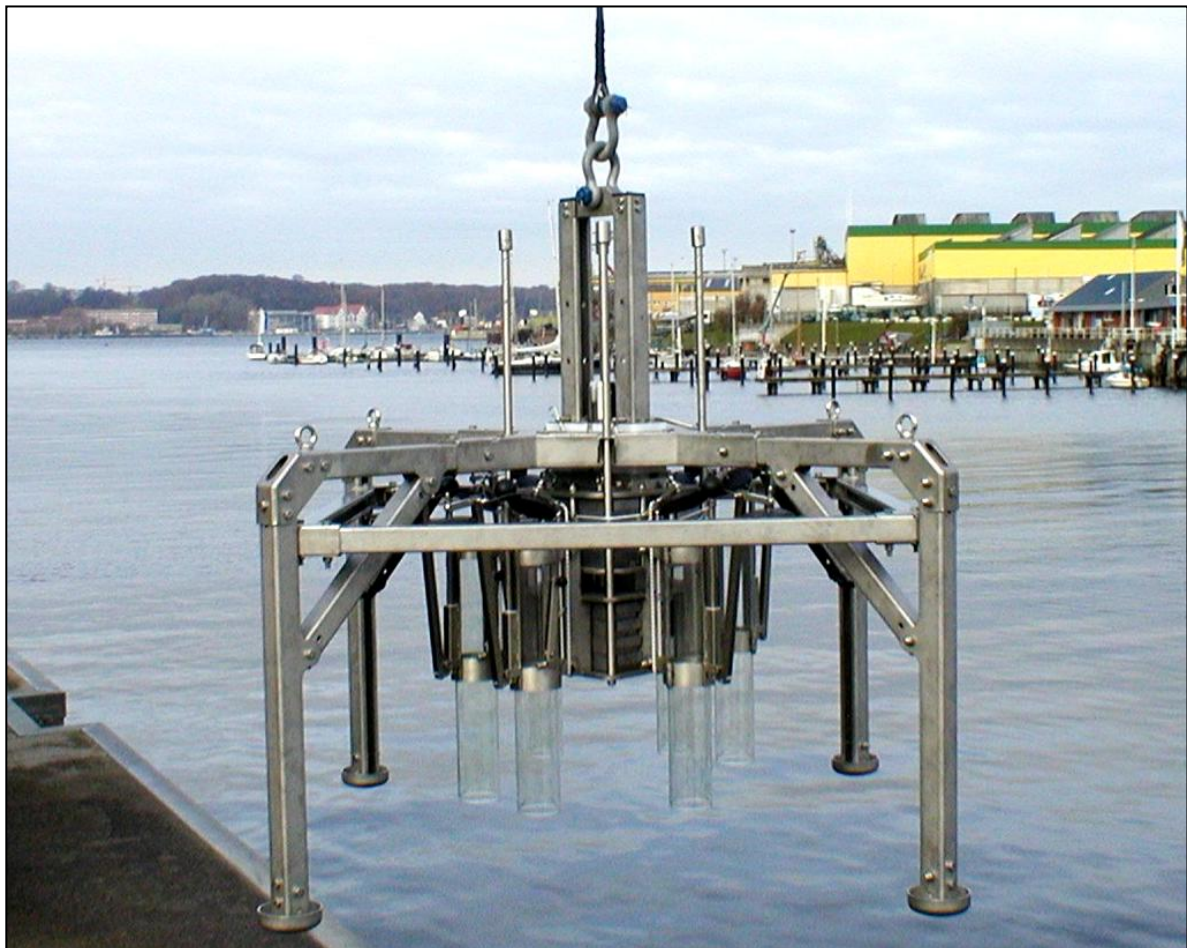


OKTOPUS

**COMPANY FOR
APPLIED RESEARCH,
INNOVATIVE TECHNOLOGIES AND
SERVICES IN OCEAN RESEARCH**

Operating Manual: Multi Corer

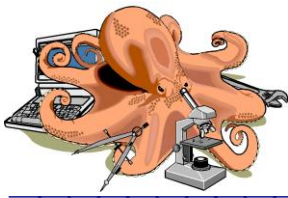
Model No.	MC600-V.2016
Serial No.	023
Weight Tara	300 kg
SWL	400 kg
Water Depth	Full Ocean Depth



Picture may differ from original product.

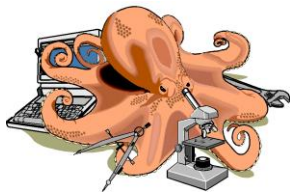
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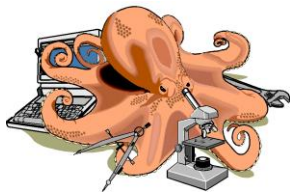


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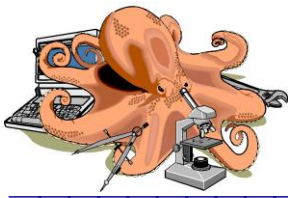


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0 Specifications

Function:	MC600-V.2016
Core tubes – Quantity:	6 pcs.
Core tubes – External diameter:	100 mm
Core tubes – Wall thickness:	2.5 mm
Core tubes – Sampling area:	71 cm ²
Core tubes – Length:	610 mm
Core tubes – Volume:	4324 cm ³
Dimensions (elevated position):	(1.5 x 1.5) m h = 1.75 m
Dimensions (lowered position):	(1.5 x 1.5) m h = 1.25 m
Weight without sample:	300 kg
Safe Working Load:	400 kg
Lead bricks – Quantity:	16 pcs.
Lead bricks – Weight per piece:	12 kg
Lead bricks – Total weight:	192 kg
Penetration depth variation by adjusting the legs:	150 mm
adjusting the penetration limiter:	200 mm
Max. instrument tilting during sampling:	± 10 °
Max. instrument tilting:	± 22.5 °
Max. water depth	Full Ocean Depth



1 General description

1.1 System outline

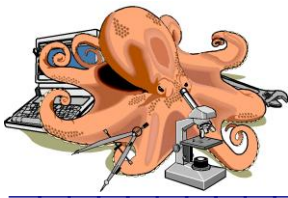
In scientific marine research the Multi Corer is used for sediment and near bottom water sampling. Its head can be lowered relatively to the frame, thus allowing the core tubes to penetrate into the ocean floor. Due to the damper the core tubes penetrate into the ocean floor, slowly sampling the sediment and smoothly without too much disturbance. When withdrawing the core tubes they are sealed with special-made lids preventing the core sample to leak. The core tubes can be removed from the head on board and layered samples can be taken in the laboratory by means of an extruder (optional accessory).

- 1 Anchorage point
- 2 Penetration limiter
- 3 Damper
- 4 Frame
- 5 Lashing points
- 6 Head
- 7 Core tube holder
- 8 Core tube



Figure 1: Multi Corer V.2013 (similar to V.2016)

Depending on the sediment composition the penetration depth can be increased or decreased in several ways. Very hard sediments can prevent penetration. For sampling these Oktopus provides alternative equipment.



1.2 General safety instructions

1.2.1 Personal safety

- Safety instructions of the vessel you are working on need to be observed!
- Protective clothing, in particular safety shoes, has to be worn at all times!
- When the device is ready for deployment hard hats and safety jackets are required on site!
- The device should be handled and operated by qualified personnel only!
- Pay attention to the ships master!

1.2.2 Product safety

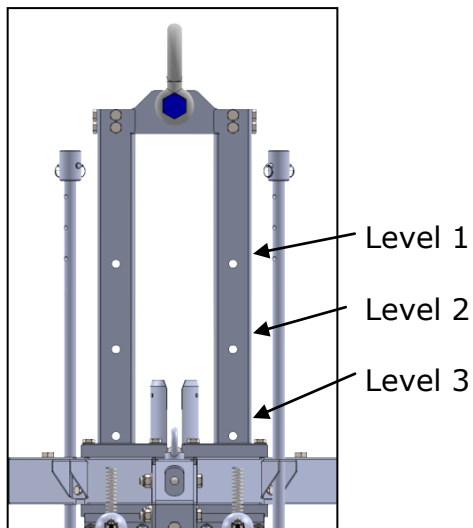


Figure 2: Locking levels

- Always secure the device from sliding and overturning using the lashing points (rough sea!)
- The movable head must be prevented from accidental lowering or elevating on deck using the safety bolts to fasten it in one of the two positions! (Requires 2 or 4 safety bolts)

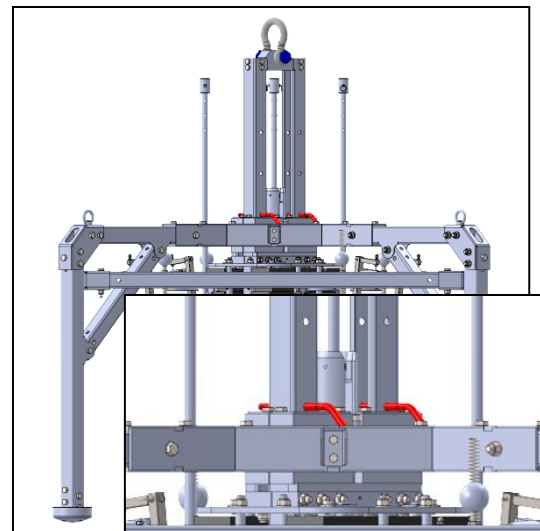


Figure 3: Elevated position

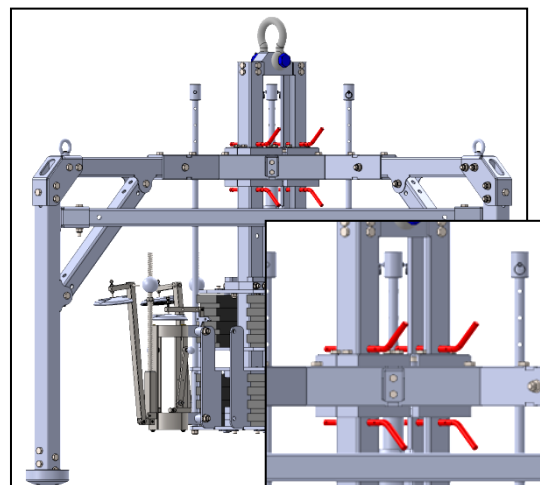
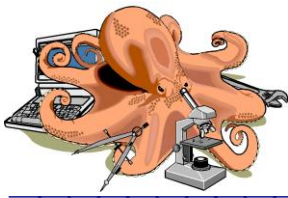


Figure 4: Lowered position



2 Commissioning



Safety bolts have to be inserted above the frame at all times (equal level, level 1, 2 or 3)! Exception: veering or hoisting during deployment



2.1 Opening the transport packaging

- Check carefully for any damage to the packaging (if any damage is discovered, immediately contact Oktopus - see p. 24 - Contact)
- Detach all screws labelled „O“
- Remove the top and front covers
- Take out the boxes
- Take out the shelves on the device (cable ties)
- Declamp and remove all lashing straps (green)
- Uncover hoisting slings



Figure 5: Open transport packaging

2.2 Lifting the device out of the transport packaging

- Use a crane or forklift truck
- The pallet remains in the box
- Remove hoisting slings before deployment



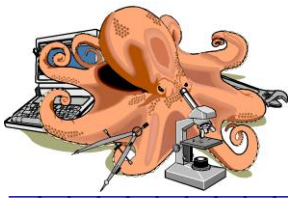
Always use ALL 4 lashing points!



Ensure that safety bolts are inserted! (see p. 5 - Product safety)



Figure 6: Multi Corer hooked on to the 4 lashing points



2.3 Removing the transport locks

- **1:** Remove the wooden spacers
- **2:** Remove the white cable ties from the locking levers
- **3:** Remove the protective foil from all lids (top & bottom) (shortly before initial use)



Protect the lids!
The sealing surface must be conserved for accurate sampling function!

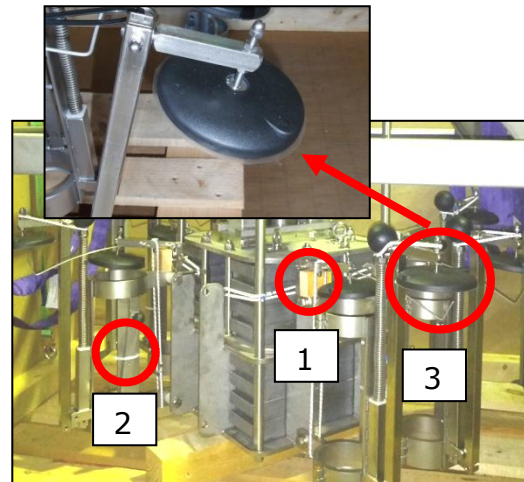


Figure 7: Transport securing devices

2.4 Elevating the head to operating position

- Remove 2x safety bolts from level 2 (see p. 5 - Figure 2)
- Hoist the head at the anchorage point (the frame needs to remain on the ground)
- Insert 2x safety bolts in level 3 and secure with spring cotter pin
- Remove 2x safety bolts from level 1



Always use the spring cotter pins on the safety bolts!



For the locking levels see p. 5 - Product safety.

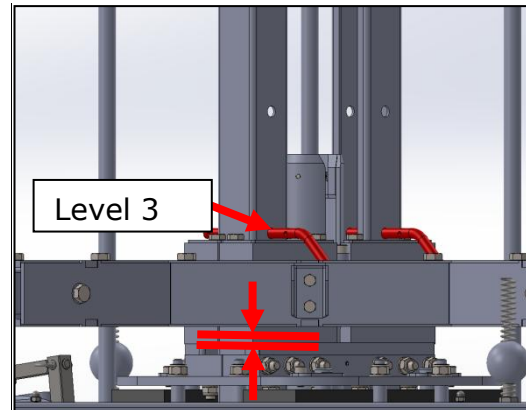


Figure 8: Safety bolts in operating position

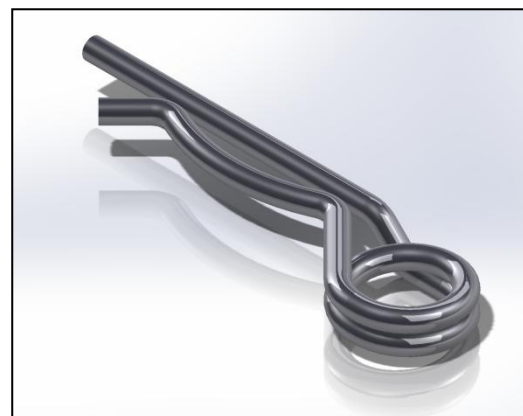
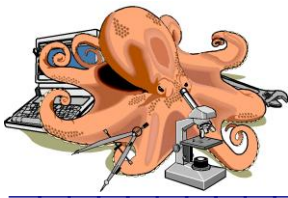


Figure 9: Spring cotter pin



3 Sampling

3.1 Preparations



Safety bolts have to be inserted above the frame at all times (equal level)! Exception: veering or hoisting during deployment

Always make sure that no ropes or wires can fall within the inner area of the frame, in air as well as during sampling.(place a net on top of the frame)!

Otherwise heavy damage will occur and constrict or prevent the further sampling process!



3.1.1 Fastening the device for deployment

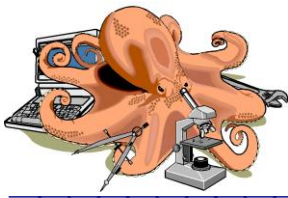
- Attach the shackles for lifting



Check the safe working load specifications of the winch wire as well as of the crane!



Figure 10: Fastened for sampling



3.1.2 Drawing the upper lids

- Raise the upper lid until it clicks into place in a 45° position



Ensure that the elastic straps are correctly positioned!



The release mechanism has to be free of sediment and smoothly movable.

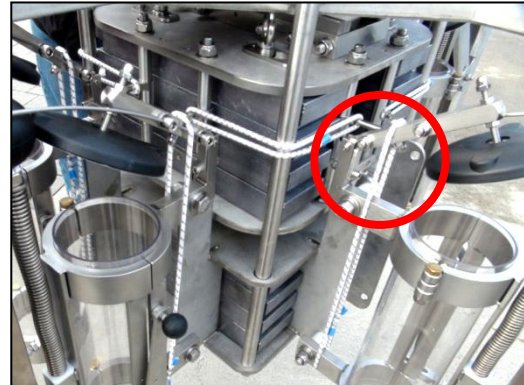


Figure 11: Drawing the upper lids



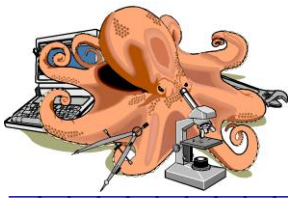
Figure 12: Upper lid locked in place

3.1.3 Fastening locking arms before inserting/removing core tubes

- Push down the black ball end; the locking arm simultaneously swings upwards
- Secure the locking arm in this position by strapping the elastic strap around the ball end and the retaining screw of the lid



Figure 13: Fastening the lower locking arms



3.1.4 Inserting the core tubes

- Release locking lever
- Insert the core tube with its ring into the notch of the core holder
- Close the core holder and lock it



The cutting edge of the core tube must face downwards!



Only use original core tubes by Oktopus! (see p. 19 -Spare parts list)

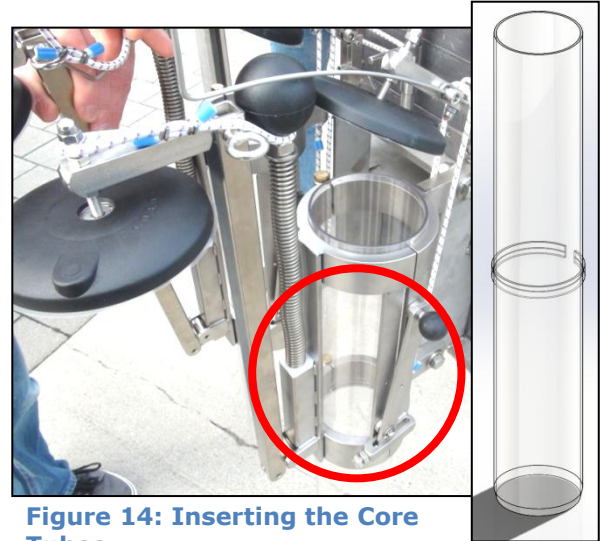


Figure 14: Inserting the Core Tubes

3.1.5 Drawing the lower lids

- Push down the black ball end; the locking arm simultaneously swings upwards
- Remove remaining elastic strap (see p. 9 - 3.1.3 *Fastening locking arms before inserting/removing core tubes*)
- Secure locking arm in elevated position (feed the wire spring through the eye bolt)



Never use damaged lids! (Check sealing surface)



Only use original parts from Oktopus (lids, elastic straps)! (see p. 19 - Spare parts list)



Figure 15: Drawing the lower lids

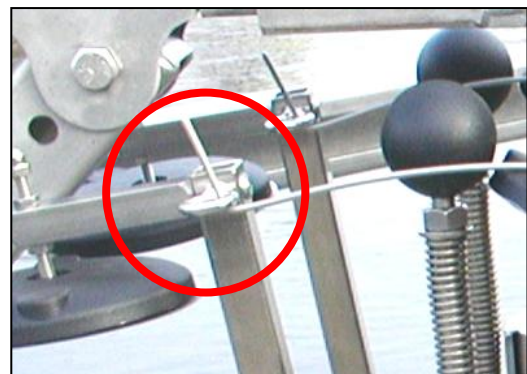
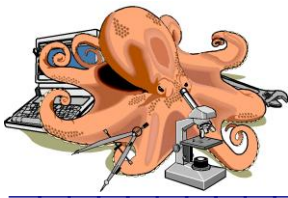


Figure 16: Arresting the wire spring



3.1.6 Adjusting the penetration depth

- If a lower penetration depth is required:
 - Adjust the penetration limiter downwards
 - Reduce the number of lead bricks (see p. 12 - 3.1.7 *Loading/unloading the lead bricks*)
 - Extend the legs by pulling out the bases



All limiters must be set to be at the same level!

- If deeper penetration depth is required:
 - Adjust the penetration limiter upwards
 - Increase the number of lead bricks (see p. 12 - 3.1.7 *Loading/unloading the lead bricks*)
 - Push back and secure bases



Do not dismantle the limiter! Otherwise closing the lids may be impossible (→ no samples)

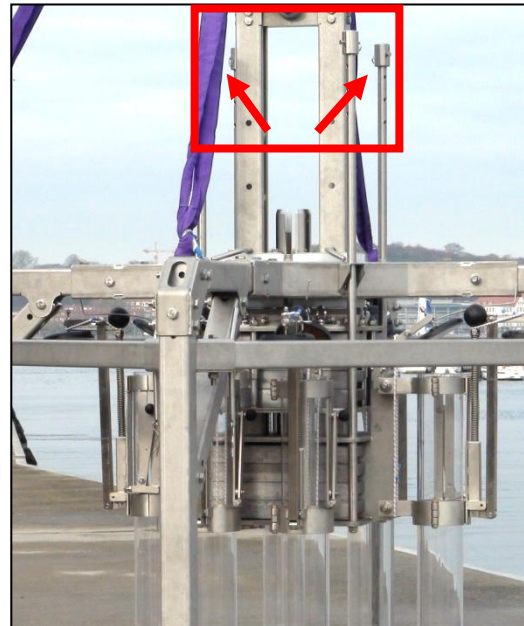


Figure 17: Penetration limiter

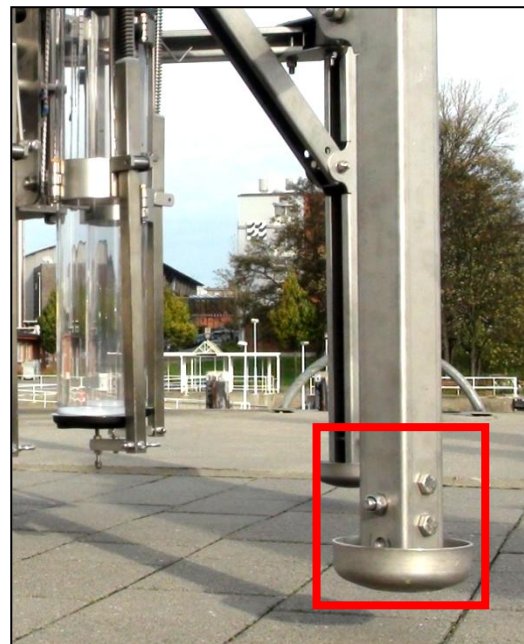
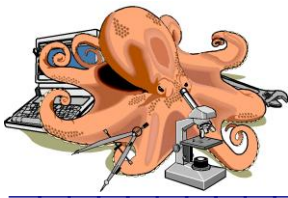


Figure 18: Adjusting the legs



3.1.7 Loading/unloading the lead bricks

- Loosen and remove the retaining screw (*Figure 20 - Part 2*)
- Reach through the frame opening for the eye bolt holding the lead bricks and keep hold of it (*Figure 20 - Part 1*)
- Slide the axle holder (*Figure 20 - Part 3*) until you can pull out the eye bolt holding the lead bricks
- Remove the other bolts in same manner
- Now you can load or unload the lead bricks



Ensure a symmetrical arrangement of the lead bricks!



Figure 19: Replacing lead bricks

- Slide the axle holder again and feed the holding bolt through the axle holder and the head
- Slide the axle holder back in the notch
- Secure axle holder with retaining screw



Check the retaining screws before every use!



Load/unload the lead bricks below from the bottom in the same way.

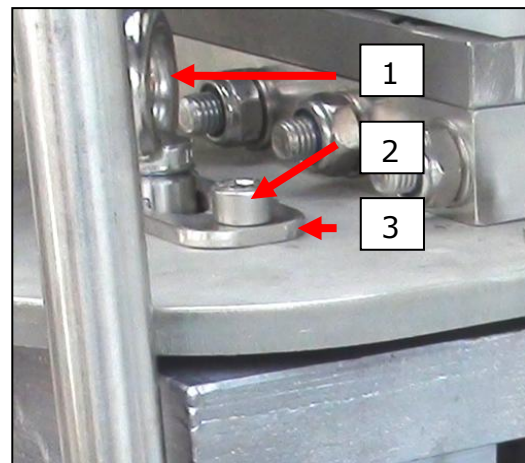
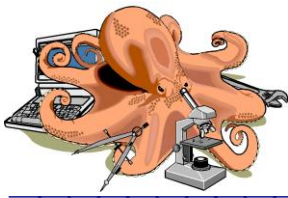


Figure 20: Detail: Replacing lead bricks



3.2 Deployment, sampling, hoisting

3.2.1 Deploying the corer

- Slightly lift the corer
- Remove safety bolts from levels 1, 2 and 3
- Lift the device overboard



Do not set down the device without safety bolts! Otherwise heavy damage can occur.



When veering the corer the safety bolts must be removed otherwise sampling will not be successful

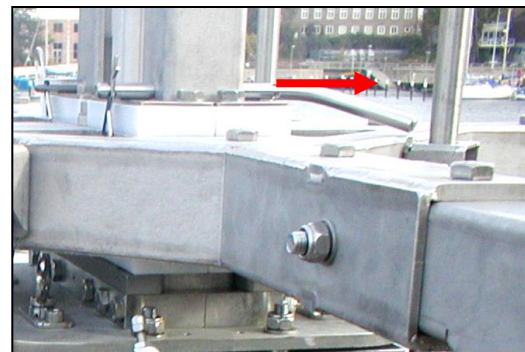


Figure 21: Deploying the corer

3.2.2 Recommended veering rate Borowski & Schriever, 1996

- Veering rate 60-90 m/min (1 - 1.5 m/s) up to 50 m above ocean floor
- Stop for 1 min at 50 m above ocean floor
- Veer to touch down on the ocean floor at 20 m/min (0,3 m/s) and additionally veer 5-20 m wire at 20 m/min (0,3 m/s)
- Stop for approx. 1.5 min



Hard sediments can prevent penetration!
(see p. 11 3.1.6
Adjusting the penetration depth)

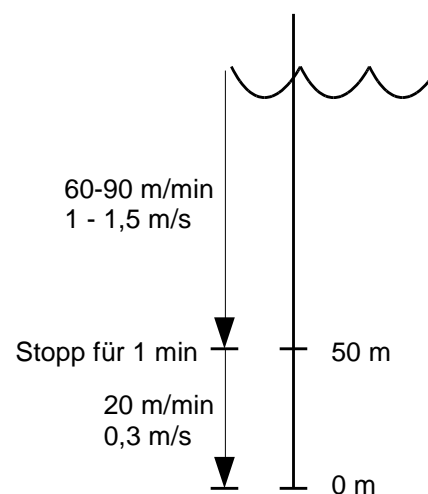
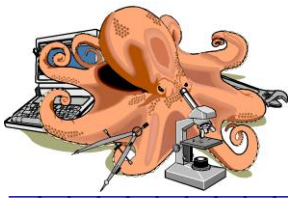


Figure 22: Recommended veering procedure



3.2.3 Recommended hoisting

- Retrieve the corer at 60 m/min (1 m/s) in order to allow the core tubes to be closed as fast as possible

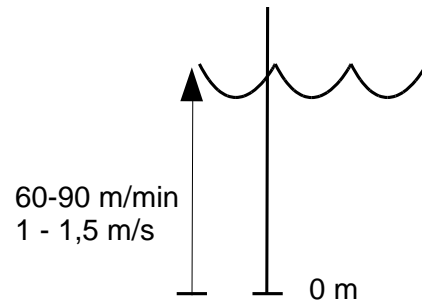


Figure 23: Recommended hoisting

3.2.4 Lowering the corer on deck

- Secure the device at the lashing points still floating above the ships deck
- Before completely setting down the device insert the safety bolts in level 3 and secure with the spring cotter pins

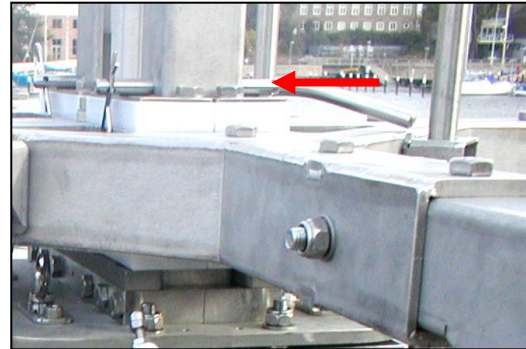
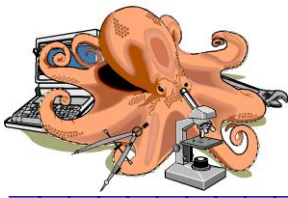


Figure 24: Lowering the corer on deck

All details are based on experiences and depend on the weather and sea conditions!

Please consult the ship's officers and crew regarding all procedures of the sampling process prior to the first deployment.





3.3 Follow-up procedures

3.3.1 Recommended removal of the core tubes

- **1:** Seal the sample with rubber stoppers
- **2:** Open lower locking arm
- **3:** Release the locking lever and remove the core tube



For details regarding the stoppers see p. 19 - Spare parts list!



Figure 25: Removing the core tube

3.3.2 Extruding the sediment

- Position the core tube above the extruder
- Remove the lower rubber stopper
- Slowly and carefully slide the core tube on the extruder
- The core tube's height can be changed with the adjusting ring



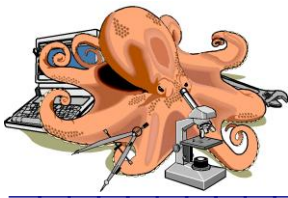
For details regarding the extruder see p. 19 - Spare parts list!



Figure 26: Extruder

3.3.3 Maintenance after each use

- Refer to p. 17 - *Maintenance and service*



4 Preparing for transport / storage

4.1 Transport

- **Option 1: Elevated position**
- Set the head to the most elevated position
- Insert 2x safety bolts in level 3 (see *Figure 2*)
- The device can be shipped with/without mounted core tubes



The lids have to be open during transport to prevent damages!

- **Option 2: Lowered position**
- Remove core tubes (see *p. 15 - 3.3.1 Recommended removal of the core tubes*)
- Secure lower locking arms in elevated position with elastic straps (see *p. 9 - Figure 13: Fastening the lower locking arms*)
- Set head to lower position
- Insert safety bolts in level 1 and 2 (see *Figure 2*)



Always use the spring cotter pins on the safety bolts!



Figure 27: Transport

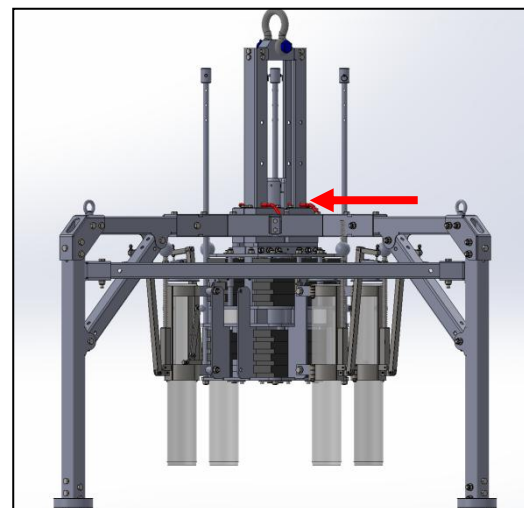


Figure 28: Elevated position

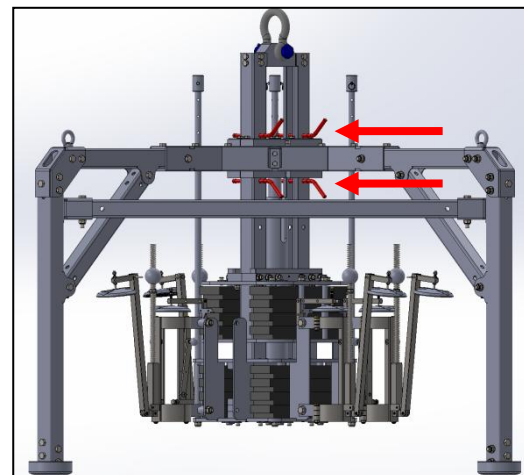
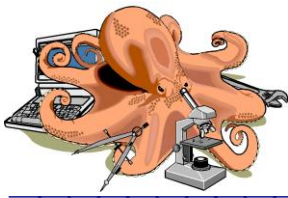


Figure 29: Lowered position

4.2 Storage

- Perform service and maintenance (see *p. 17 - Maintenance and service*)
- Prepare corer for transport
- Remove elastic straps and keep them unstressed in a cool and dry place



5 Maintenance and service

5.1 Visual inspection prior to and after every use

- Inspect all connection components (screws, nuts, washers, bolts, spring cotter pins, locking rings, elastic straps)
- Check the upper and lower retaining screws of the lead bricks (No. 1)
- Check for damage
- Check guide bars and all moving parts for foreign matter (No. 2)

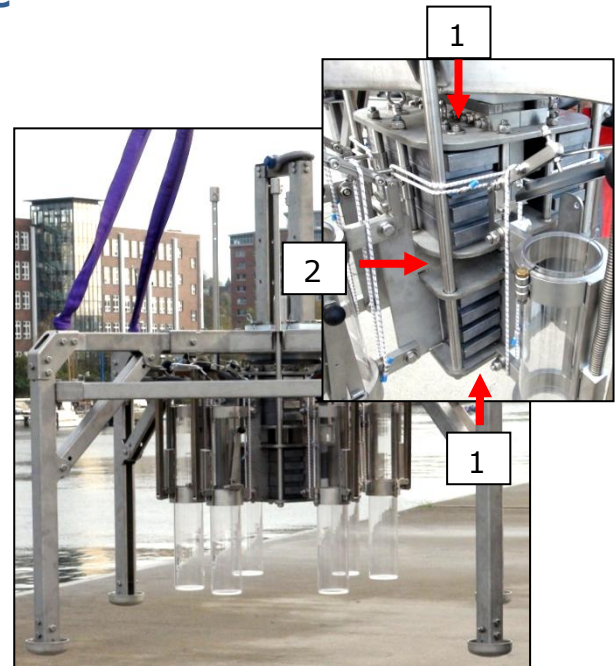


Figure 30: Visual inspection



Troubleshooting need to be done before the next use in order to ensure safety!



When replacing self-locking nuts always use new and unused nuts!



Torque up all M12 screws (frame) like in the attached guideline!



Please dispose of used parts properly or send them back to Oktopus GmbH!



Do not use lubricants or the like!

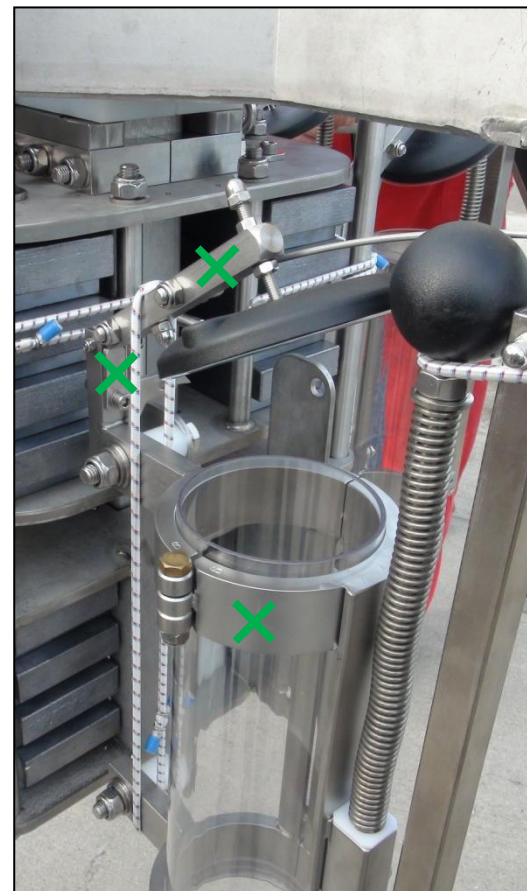
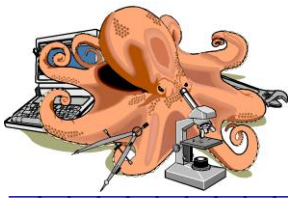


Figure 31: Ensure that all parts marked "X" are free-moving

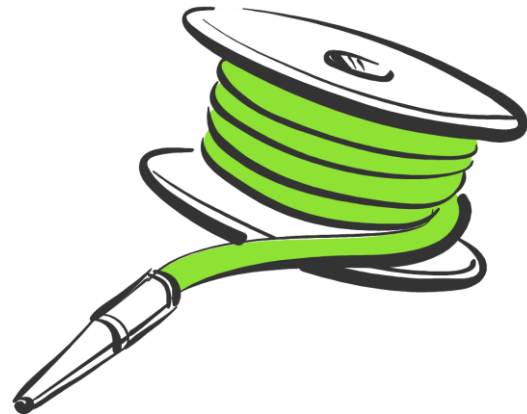


5.2 Flushing after each deployment

- After each sampling the device should be flushed thoroughly with fresh water
- Check the movability of all moving parts



Sediment remains within the mechanical parts may cause damage and/or loss of the samples!



5.3 Flushing after each cruise

- See p. 18 -5.2 Flushing after each deployment
- In addition the damper should be flushed:
 - o Remove core tubes (see p. 15 - 3.3.1 *Recommended removal of the core tubes*)
 - o Fasten the lower locking arms with elastic straps in elevated position (Figure 13)
 - o Let the head down completely on a soft surface (e. g. wood)
 - o Flush damper with jet of fresh water from below the piston top down



Omitting the cleaning process may cause malfunction or even destroy the corer!



Figure 32: Lower the head in order to flush the damping tube

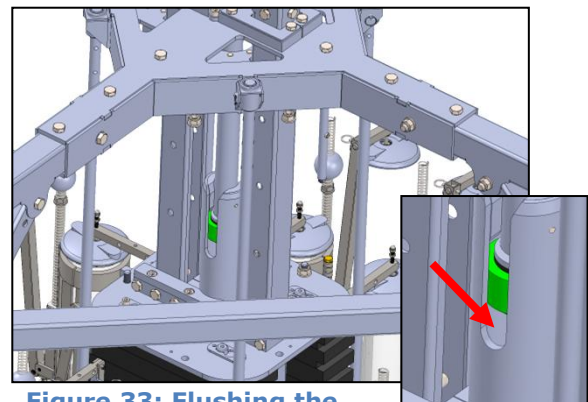
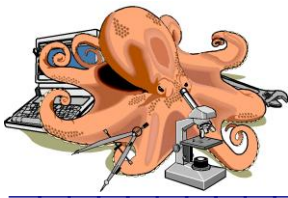


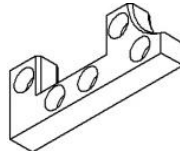
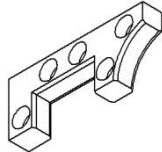
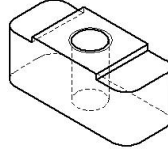
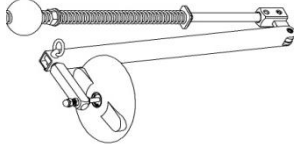

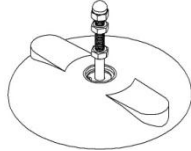
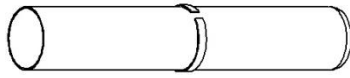


Figure 33: Flushing the damping tube

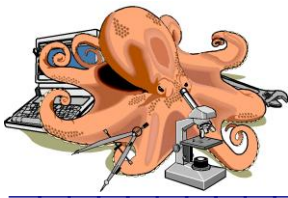
5.4 Replacing elastic straps


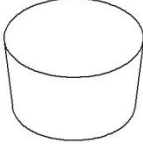

- All elastic straps should be replaced and when necessary but at least every 1-2 years



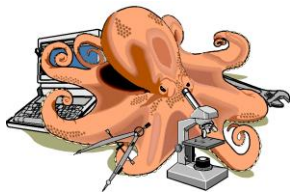
6 Spare parts list

Pos.	Serial Number	Description	Material	
1	105-01.01.09	Guide piece left	Plastic	
2	105-01.01.10	Guide piece right	Plastic	
3	105-01.01.11	Slot nut	1.4571 stainless steel	
4	105-01.04.05.XX	Lower locking arm (pre-assembled) incl. spring	various	
5	105-01.04.05.27	Wire spring	1.4571 stainless steel	
6	105-01.04.06	Core tube lid	various	
7	105-01.04.07	Core Tube 100x2.5 with ring	Polycarbonate	
8	105-01.50	Elastic strap releasing mechanism	Rubber	
9	105-01.51	Elastic strap for locking arm	Rubber	



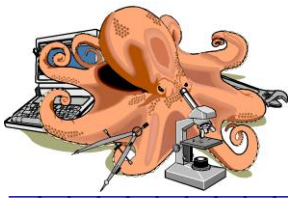
10	105-01.52	Elastic strap for upper lid	Rubber	
11	105-01.53	Rubber stopper 100x2.5	Rubber	
12	105-01.54	Extruder 100x2.5	various	

More spare parts for repair, several screws, nuts etc. are available on request.
See *p. 24 - Contact*.



7 Troubleshooting

problem	possible cause	solution
The lids are still drawn when the device is being retrieved (upper and lower lids)	1. Safety bolts have not been removed	- Remove safety bolts before deployment (see <i>p. 13 - Deployment, sampling,)</i>
	2. Corer has not arrived at the sea floor or not been there long enough	- Lower the corer to the sea floor (see <i>p. 13 - Deployment, sampling,)</i>
	3. Sediment jammed the mechanical parts	- Thoroughly flush the device and check all moving parts (see <i>p. 17 - Maintenance and service</i>)
	4. Damper is jamming	- Thoroughly flush the damper and the corer (see <i>p. 17 - Maintenance and service</i>)
The lower lids are still drawn when the device is being retrieved	Elastic straps fastening the lower arms are still attached	- Remove elastic straps and lock lower arm in place with wire spring (see <i>p. 10 - 3.1.5 Drawing the lower lids</i>)
The core tubes do not include a sample when the device is being retrieved (lids are closed)	1. Lids were not drawn	- Draw lids before deployment (see <i>p. 9 - 3.1.2 Drawing the upper lids</i>)
	2. Release mechanism was triggered prematurely (strong vertical vibration at the winch wire; veering speed was too high)	- Reduce winch wire vibrations reduce the veering speed of the corer
Some lids are closed while others are still drawn	Sediment has penetrated the releasing mechanism of some core tubes	- Thoroughly flush the device and check all moving parts (see <i>p. 17 - Maintenance and service</i>)



Different levels of sediment within the core tubes (equal gradient)	1. Multi Corer was tilted by the ship's movement when penetrating	- Shorten the penetration duration - Decrease the ship's movement
	2. Topography	-
Core tubes are completely filled with sediment	Very soft sediment	- Reduce penetration depth (see p. 11 - 3.1.6 <i>Adjusting the penetration depth</i>) and flush damping tube (see p. 17 - <i>Maintenance and service</i>) - If this does not help, please contact Oktopus
Parts are missing or deformed when the corer is being retrieved	Winch wire got inside the device and damaged it on haul	- Secure the device's innards from cords or wires (see p. 8 - <i>Preparations</i>)

If you should encounter any other problems or come across questions please do not hesitate to contact us (see p. 24 - Contact).

7.1 Time schedule:

- Calculated time for: 30-60 min
 - o cleaning, equipping, fastening, checking
- Duration depending on depth:
 - o Lowering & hoisting: 60 m/min 34 min / 1000 m

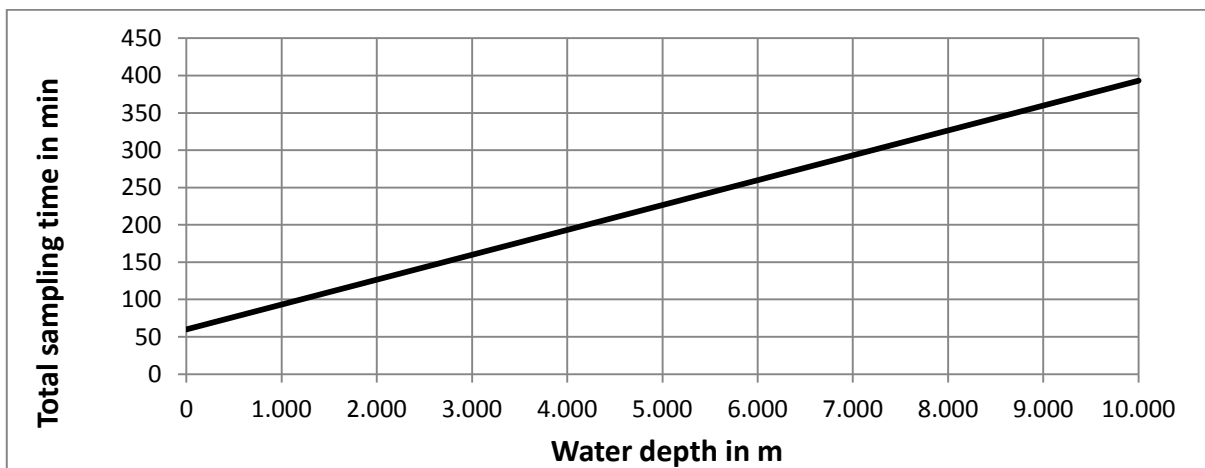
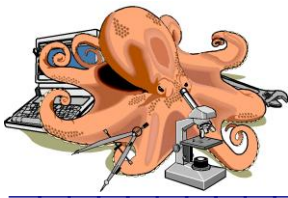


Figure 34: Total sampling time vs. water depth



9 Contact

Oktopus

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