

MULTI SEDIMENT TRAP MST 6

OPERATION MANUAL

Product ID 444 101

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PREFACE

NOTICE



Please read this manual carefully before operating or performing maintenance on the instrument. Pay special attention to all danger, warning and caution statements. Failure to do so could result in serious injury and/or damage to the instrument. Keep manual available at all times.

LAYOUT AND MEANING OF WARNINGS

All safety instructions found in this operation manual are composed in accordance with the following pattern (signal words):

DANGER

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to personal injury.
NOTICE may also indicate a situation which, if not avoided, may cause damage to equipment.

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GENERAL DESCRIPTION

The MULTI SEDIMENT TRAP **MST** has been designed for autonomous operation in lakes, continental shelf and aquatic environments with relatively high vertical particulate flux value. The instrument does not need heavy moorings it can be easily deployed and recovered from smaller vessels.

The cylinder of the sampling device is equipped with a dismountable louvre at the opening to avoid washing out of the sediment from the upper part of the cylinder. The inside is completely metal-free.

With the MST the samples are isolated from the surrounding environment at the end of the preselected sampling interval. During deployment and recovery operations the trap bottom is open, allowing a free flow through the cylinder.

The MST is equipped with a microprocessor controlled motor unit activating the collecting bottles in individually programmed sampling intervals (from 1 minute up to 8760 hours) in real-time or in intervals. The programming of the motor unit is made by using the software OceanLab.

Power supply consists of 3 long-time lithium batteries placed in a removable battery housing.

STANDARD EQUIPMENT

1. 1 Sediment trap (single bottle version)
2. 1 Adaptor tube — Fig. 1 H
3. 1 Underwater mounting base with motor unit and battery housing
4. 6 Collecting bottles 250 ml with screw cap
5. 1 Bridle, 30 cm long with shackles
6. 3 Lithium batteries DURACELL DL 123 A / 3 V or equivalent
7. 1 Programming cable, 30 meters long, SUBCONN IL 5 F -> sub-D 9-pin
8. 1 Dummy connector SUBCONN DC 5 F
9. 1 Spare O - ring 10 x 4 for axle duct — Fig. 2 C
10. 1 Spare O-ring no. 020 for axle box case — Fig. 2 E
11. 1 Spare O-ring no. 151 for pressure housing — Fig. 2 H
12. 1 Spare O-ring no. 009 for switch shaft — Fig. 2 J
13. 1 Spare O-ring no. 120 for battery housing
14. 1 Can O-ring lubricant
15. 1 Can pin-lubricant
16. 1 Hexagon socket screw key 5 mm
17. 1 Hexagon socket screw key 2.5 mm
18. 1 Spanner 17 mm
19. 1 Felt-tip pencil, black, water resistant
20. 1 Operation manual
21. 1 USB flash drive OceanLab
22. 1 USB-to-Serial-adapter
23. 3 Battery-clips

TECHNICAL DATA

Sediment Trap:	
Collecting area:	0.015 m^2
Length of collecting tube:	560 mm
Angle of funnel:	40°
Ratio diameter - collecting tube length:	1 : 4
Grid dimensions:	20 x 20 x 40 mm
Material trap and funnel:	uPVC
Material collecting bottle:	Polyethylene
Dimensions:	
Array:	320 mm dia.
Height:	1330 mm
Weight in air:	12 kg
Weight in water:	5 kg
Material:	
Base plate and rotary table:	uPVC
Array:	Titanium
Motor unit:	Titanium
Battery housing:	Titanium
Operational depth:	
Standard:	3000 m
Option:	6000 m
Connector at motor unit:	
Standard:	SUBCONN BH 5 M
Collecting time per collecting bottle:	
individually programmable:	1 min - 8760 h
Power supply:	
3 lithium batteries:	DURACELL DL 123 A / 3 V or equivalent
Capacity of batteries sufficient for:	1 one-year-operation with 6 collecting bottles up to 20 operations with shorter collecting times
or:	within 12 months
Storage time of new batteries:	approx. 10 years
Operating temperature:	
Motor unit:	- 40...+ 85°C

PREPARING THE COLLECTING BOTTLES

To guarantee proper isolation of the samples from the surrounding environment it is recommended to use the original collecting bottles delivered with the MST.

> ***WARNING***
>
> 
>
> MOVING PARTS CAN CRUSH AND CUT!
> Depending on the current programming of the MST the rotary table may start moving at any time. Keep fingers clear of gear wheel and bottle receptacles.

1. Switch underwater unit off.
2. Mark the collecting bottles with numbers **1 - 6** by using a water proof felt-tip pencil.
3. Fill the collecting bottles with sea water until overflow. If possible use sea water from the desired operating depth, else take surface water **but no fresh water**. Add a preservative if required.
4. Screw the collecting bottles into the rotary table according to their numbers. Position **0** remains vacant.
5. Unscrew the black plastic screws located at the upper side of the base plate.
6. Fill sea water into the threaded borings of the black plastic screws (e.g. by using a washing bottle) until overflow.
7. Remount the black plastic screws. This will displace the surplus seawater. Fasten the screws hand-tight only.

> ***NOTICE***
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> 
>
> Do not use any tool when fasting the black plastic screws!

OPERATION

> ***WARNING***
>
> 
>
> MOVING PARTS CAN CRUSH AND CUT!
> Depending on the current programming of the MST the rotary table may start moving at any time. Keep fingers clear of gear wheel and bottle receptacles.

Prior to any operation the MST must not be exposed to temperatures below - 40°C!

1. To avoid malfunctions make sure that the dummy SUBCONN DC 5 F is plugged into the connector SUBCONN BH 5 M at the underwater unit.
2. Just before deployment the MST is started by setting the lever switch on the outside of the underwater unit to position **I**.
3. An interruption resp. abortion of the program execution can be made at any time by setting the lever switch on the outside of the underwater unit into position **O**.
4. To reset the MST into start position after a program abortion, follow the instruction according the chapter OPERATION WITH LESS THAN 6 COLLECTING BOTTLES, page 9.

OPERATION WITH LESS THAN 6 COLLECTING BOTTLES

WARNING



MOVING PARTS CAN CRUSH AND CUT!
Depending on the current programming of the MST the rotary table may start moving at any time. Keep fingers clear of gear wheel and bottle receptacles.

To avoid malfunctions make sure that the dummy SUBCONN DC 5 F is plugged into the connector SUBCONN BH 5 M at the underwater unit when no connection to the personal computer is intended.

1. If the MST is to be operated with less than 6 collecting bottles the bottles have to be screwed into the rotary table in numerical order 1, 2, 3 etc. The remaining positions remain vacant.
2. After operation the lever switch on the outside of the underwater unit has to be switched into position **O**. The zero mark 0 is not below the SEDIMENT TRAP.
3. To prepare the next operation the rotary table has to be set to start position. Therefore the underwater unit has to be connected to the personal computer and the lever switch has to be switched into position **I**.
4. At the PC start OceanLab and click button CONNECT inside the toolbar.
5. By clicking button ACTION the next collecting bottle will be activated. Activate the button ACTION repeatedly until the motor counter indicates 7. Now the zero mark 0 of the rotary table is in its initial position below the SEDIMENT TRAP.
6. Switch the lever switch of the underwater unit into position **O**.
7. Remove the programming cable to PC from the underwater unit. Plug the dummy SUBCONN DC 5 F into the connector SUBCONN BH 5 M of the underwater unit.

MAINTENANCE

INSTALLATION OF BATTERIES

1. Make sure that the lever switch at the outside of the underwater unit is switched to position **O**.
2. Unplug the cable connection between battery housing and motor unit at the underwater unit.
3. Loosen the battery housing from the motor unit by unscrewing the star grip screw and take the battery housing into a dry room.
4. Unscrew the union nut from the battery housing and remove the pressure tube.
5. Place 3 lithium batteries DURACELL DL 123 A / 3 V or equivalent into the battery holders. Observe **correct polarity**. Secure batteries with retainer covers.
6. Make sure that the sealing surface in the pressure tube is clean. If necessary use a lint-free cloth for cleaning.

NOTICE

Do not use absorbent cotton for cleaning!

7. Slightly grease the sealing surface in the pressure tube with O-ring lubricant.
8. Make sure that the O-ring in the flange is clean and undamaged. If necessary use a lint-free cloth for cleaning.
9. If the O-ring is defective,
    a. use a blunt tool (e.g. ball point pen cartridge or a piece of wood) to take the O-ring.

NOTICE

Take care that the groove in the flange is not damaged!

    b. Make sure that the groove in the flange is clean and undamaged. If necessary use a lint-free cloth for cleaning.
    c. Slightly grease a spare O-ring No. 120 with O-ring lubricant.
    d. Put the greased O-ring into the groove of the flange.
10. Carefully press the flange into the pressure tube.
11. Fasten the flange at the pressure tube with the plastic union nut.

NOTICE

Slightly grease the pins of the underwater connectors with pin lubricant and re-establish the electrical connection between battery housing and motor unit.

In no case must the underwater unit be submerged without the appropriate cable connections resp. dummy connectors attached to the respective connectors!

12. Place the battery housing in its seat at the motor unit.
13. Fix the battery housing to the motor unit with the star grip screw.

> ***NOTICE***
>
> Do not use any tool when fasting the grip screw!

14. It is highly recommended to replace batteries before any deployment if the indicated voltage is below 8.9 V in standby mode (motor not running).

ASSEMBLY OF THE MULTI SEDIMENT TRAP

See Fig. 1.

1. Use sediment trap (single bottle version) as sampling device for the Multi Sediment Trap.
2. Instead of a collecting bottle the adaptor tube **H** is screwed into the lower end of the funnel.
3. Unscrew nut **A** from holding rod **D**, screw nut **C** into direction of base plate **E** until stop, loosen both hexagon socket screws **F**. Tools: Spanner 17 mm, hexagon socket screw key 5 mm
4. Place adaptor tube of the SEDIMENT TRAP into the clamping ring **G** but do not fasten it yet. **There must be no gap between adaptor tube and base plate!**
5. At the same time lead the threaded part of the holding rod **D** into the large boring of the wire clamp block **B**.
6. Fasten the sediment trap with the clamping ring **G**. Tool: Hexagon socket screw key 3 mm.
7. Screw nut **C** upward until its cylindrical part is completely inside the large boring of the wire clamp block **B**.
8. Screw nut **A** with its cylindrical part ahead onto the threaded part of the holding rod **D** and tighten it. Fasten both hexagon socket screws **F**. Tools: Spanner 17 mm, hexagon socket screw key 5 mm.

REMOVAL OF THE UNDERWATER UNIT

To avoid malfunctions make sure that the dummy SUBCONN DC 5 F is plugged into the connector SUBCONN BH 5 M at the underwater unit when no connection to the personal computer is intended.

1. Make sure that the lever switch at the underwater unit is in position **O**.
2. Unscrew the 3 hexagon socket screws M 6 which are located at the bottom side of the base plate. Tool: Hexagon socket screw key 5 mm
3. Remove the underwater unit.

MOUNTING OF THE UNDERWATER UNIT

The MST does only work properly if the synchronization between underwater unit and rotary table has been established. In order to re-establish the synchronization the following steps have to be carried out:

1. Connect the dismounted underwater unit to the personal computer.
2. Switch the lever switch at the underwater unit into position **I**.
3. At the PC start OceanLab and click button CONNECT inside the toolbar.

4. Activate the CONTROLLING MODE.
5. Select BOTTLE from the list of implements.
6. Click button HALF STEP once. The axle of the underwater unit will carry out a half revolution and the motor counter will be set to 0.
7. Switch the lever switch at the underwater unit into position **O**.
8. Turn the rotary table by hand until the bore at position 0 (which cannot be equipped with a collecting bottle) is aligned as good as possible with the bore of the sediment trap.
9. Remount the underwater unit without distorting the position of the rotary table. Remount the 3 hexagon socket screws M 6 from bottom side of the base plate. Establish a small slackness between gear wheel of the underwater unit and the rotary table.
   Tool: Hexagon socket screw key 5 mm

> ***WARNING***
>
> 
>
> MOVING PARTS CAN CRUSH AND CUT!
> Depending on the current programming of the MST the rotary table may start moving at any time. Keep fingers clear of gear wheel and bottle receptacles.

10. Switch the lever switch at the underwater unit into position **I**.
11. At the PC start OceanLab and click button CONNECT inside the toolbar.
12. Verify the component “Bottle” reads 0 (zero). If it doesn’t click “Reset Counter” in the “Motor Position” window.
13. Click ACTION once. The rotary table will move to the next position. When the movement has stopped press ACTION again, repeat this for the remaining positions until the “Motor Counter” indicates position 7 (which coincides with position 0).
14. Check that the initial position 0 is located exactly below the sediment trap. If not: Dismount and re-mount the underwater unit as described above.
15. Remove the connecting cable to PC from the underwater unit.
16. Slightly grease the pins of the connector BH 5 M at the underwater unit with pin lubricant, plug the dummy connector at the underwater unit and secure it with it’s locking sleeve.

> ***NOTICE***
>
> **In no case must the underwater unit be submerged without the appropriate cable connections resp. dummy connectors attached to the respective connectors!**

17. Switch the lever switch at the underwater unit into position **O**.

LOCALIZATION OF FAULTS

To avoid malfunctions make sure that the dummy connector SUBCONN DC 5 F is plugged into the connector SUBCONN BH 5 M at the motor unit when no connection to the personal computer is intended.

NO DATA

Symptom: Upon startup of OceanLab the CONNECT dialog window indicates NO DATA:

Measures:

- Underwater unit is switched off. Switch lever switch of the underwater unit into position **I**.
- One or more batteries are placed in the battery housing in wrong polarity. Check polarity.
- Batteries of the underwater unit are exhausted. Install new batteries.
- The connected underwater unit is not supported by OceanLab. Use compatible version of OceanLab resp. underwater unit.
- The programming cable between underwater unit and PC is defective. Check cable.

Symptom: During work with OceanLab the CONNECT dialog box indicates NO DATA:

Measures:

- Underwater unit is switched off. Switch lever switch of the underwater unit into position **I**.
- Batteries of the underwater unit are exhausted. Install new batteries.
- The programming cable between underwater unit and PC is defective. Check cable.

NOT FUNCTIONING AS EXPECTED

Symptom: A correctly programmed underwater unit did not execute the mission:

Measures:

- Batteries of the underwater unit are exhausted. Install new batteries.
- The dummy SUBCONN DC 5 F has not been plugged into the connector SUBCONN BH 5 M at the underwater unit. Prior to any operation make sure that the connector SUBCONN BH 5 M at the underwater unit is protected by the dummy SUBCONN DC 5 F.
- All real-time depending activating events had passed when the underwater unit has been switched on for the operation. Repeat the mission with a new program with correct dates and times.
- Check the gear on the underside of the MST for any debris that may have blocked the gear.

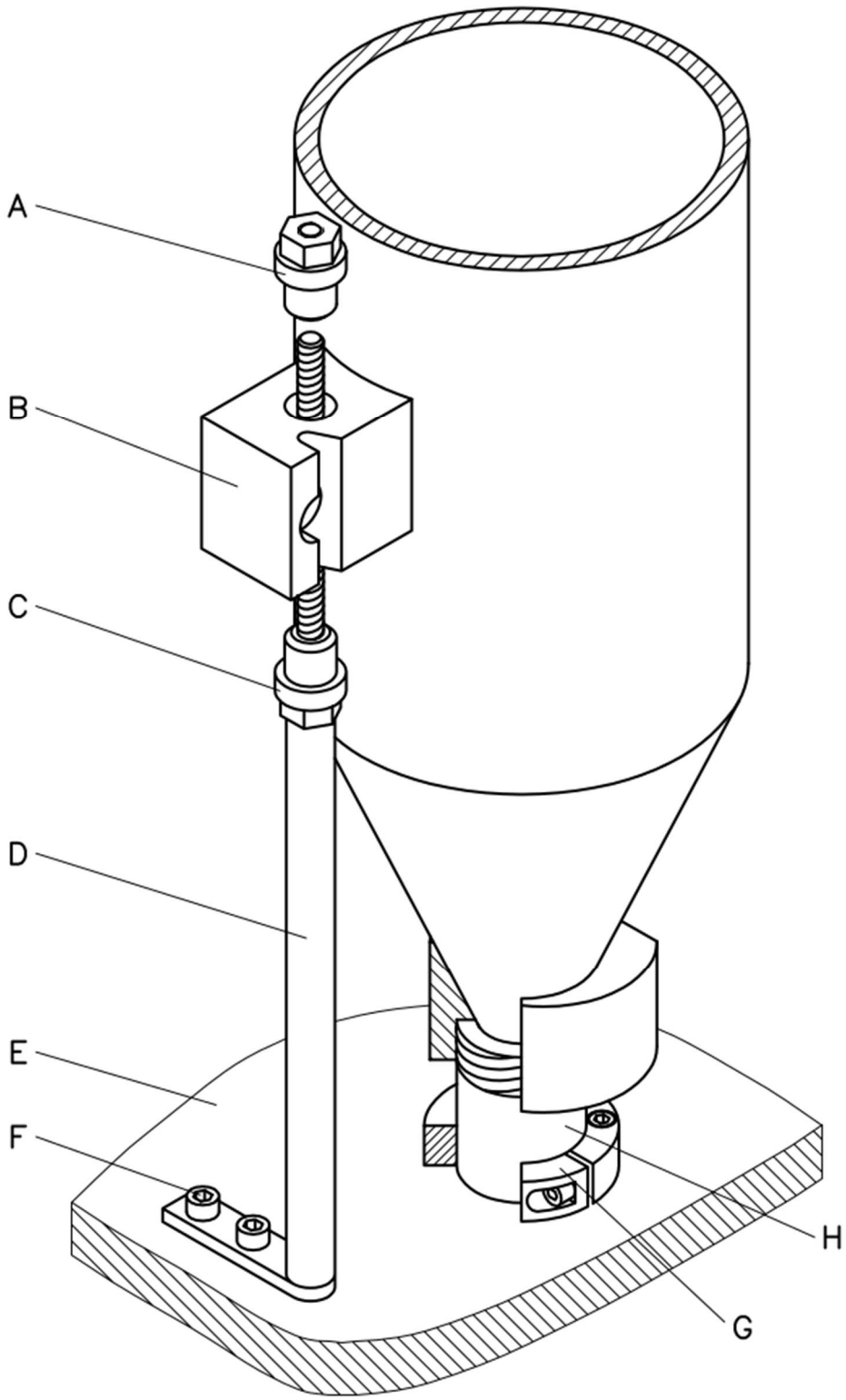


Fig. 1

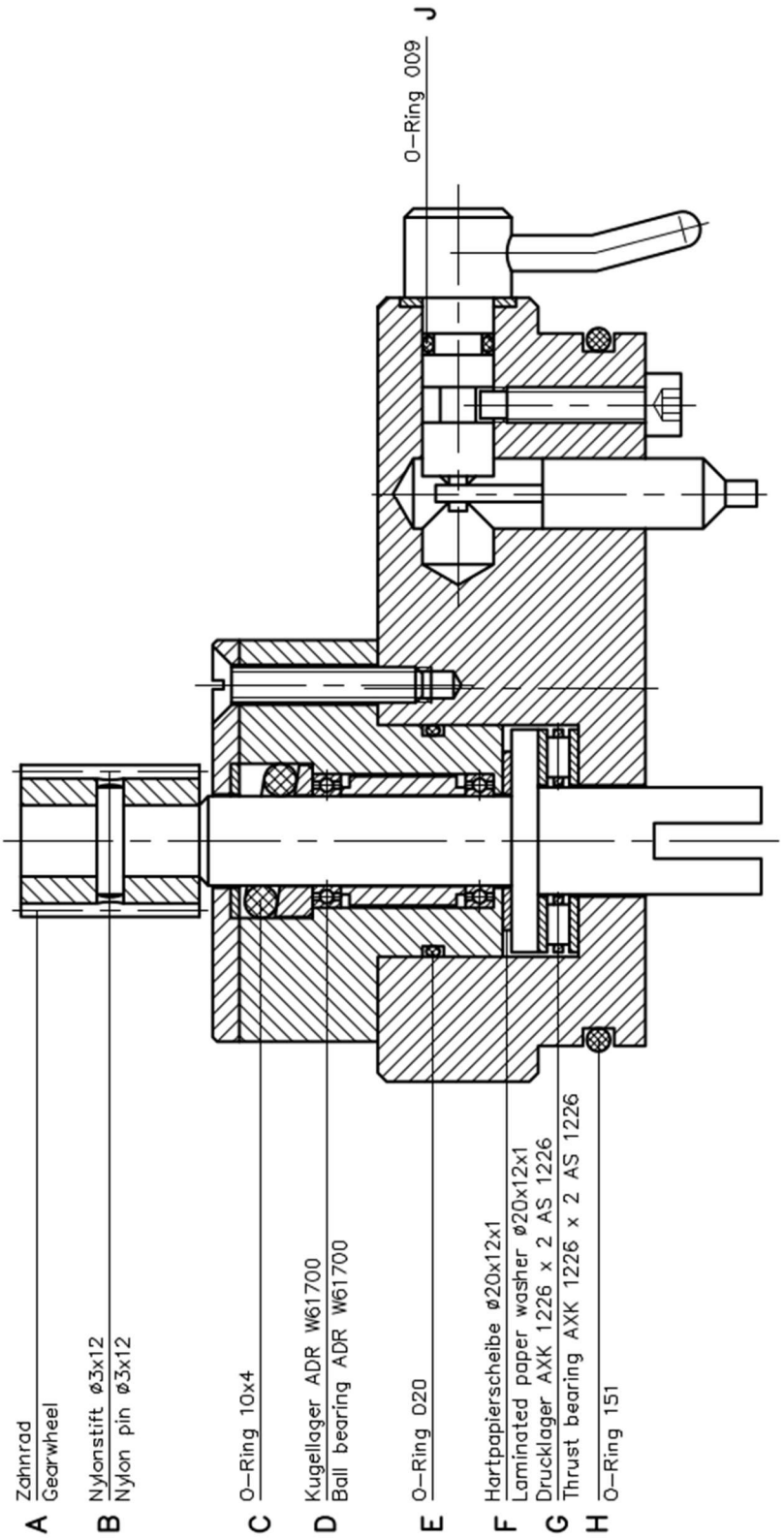

A Zahnrad
Gearwheel
B Nylonstift ø3x12
Nylon pin ø3x12
C O-Ring 10x4
D Kugellager ADR W61700
Ball bearing ADR W61700
E O-Ring D20
F Hartpapierscheibe ø20x12x1
Laminated paper washer ø20x12x1
G Drucklager AXK 1226 x 2 AS 1226
Thrust bearing AXK 1226 x 2 AS 1226
H O-Ring 151
J O-Ring 009

Fig. 2