HYDRO-BIOS

Apparatebau GmbH

MULTI SEDIMENT TRAP MST6 TITANIUM ADVANCED VERSION
- REAL-TIME AND INTERVAL PROGRAMMING -

CATALOGUE NO. 444 101 TI

OPERATION MANUAL

Edition 05/2022

CONTENTS

GENERAL DESCRIPTION

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

The cylinder of the sampling device is equipped with a dismountable buffle grid 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 MULTI SEDIMENT TRAP 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 MULTI SEDIMENT TRAP 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 via Personal Computer by using the software OceanLab.

Power supply is made by 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 metres long, SUBCONN IL 5 F --> sub-D 9-pin
8.   1 Adaptor sub-D 9-pin to USB
9.   1 Dummy SUBCONN DC 5 F
10. 1 Spare O - ring 10 x 4 for axle duct   Fig. 2 C
11. 1 Spare O - ring No. 020 for axle box case   Fig. 2 E
12. 1 Spare O - ring No. 151 for pressure housing   Fig. 2 H
13. 1 Spare O - ring No. 009 for switch shaft   Fig. 2 J
14. 1 Spare O - ring No. 120 for Battery Housing
15. 1 Can O-ring lubricant
16. 1 Can pin lubricant
17. 1 Hexagon socket screw key 3 mm
18. 1 Hexagon socket screw key 5 mm
19. 1 Spanner 17 mm
20. 1 felt-tip pencil black, water-resistant
21. 1 Operation manual
22. 1 USB-Stick OceanLab

TECHNICAL DATA

Sediment Trap

Collecting area:	0,015 m²
Length of collecting tube	560 mm
Angle of funnel	40°
Ratio between diameter and collecting tube length	1 : 4
Grid dimensions	20 x 20 x 40 mm
Material trap and funnel	PVC
Material collecting bottle	Polyethylene

Dimensions:

Array:	320 mm dia.
Height:	1200 mm
Weight in air:	12 kg
Weight in water:	5 kg

Material:

Base Plate and Rotary Table:	PVC
Array:	Titanium
Motor Unit:	Titanium
Battery Housing:	Titanium

Operational depth:

Standard:	3000 metres
Option:	6000 metres

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
or:	up to 20 operations with shorter collecting times within 12 months
Storage time of new batteries:	approx. 10 years

Operating temperature:

Motor Unit:	- 40...+ 85°C

ASSEMBLY OF THE MULTI SEDIMENT TRAP (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 slit 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.

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 MULTI SEDIMENT TRAP.

1. Inscribe the collecting bottles with numbers **1 - 6** by using a water proof felt-tip pencil.

2. 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.

3. Screw the collecting bottles into the rotary table according to their numbers. Position **0** remains vacant.

4. Unscrew the black plastic screws located at the upper side of the base plate.

5. Fill sea water into the threaded borings of the black plastic screws (e.g. by using a washing bottle) until overflow.

6. Remount the black plastic screws thus displacing the surplus seawater. Fasten the screws **fingertight only**, do not use a tool.

INSTALLATION OF BATTERIES

1. Make sure that the lever switch at the outside of the Motor Unit is switched to position **O**.

2. Unplug the cable connection between Battery Housing and Motor Unit at the Motor Unit.

3. Loosen the Battery Housing from the Motor Unit by screwing the star grip screw counter-clockwise.

4. Bring the Battery Housing into a dry room.

5. Unscrew the union nut from the Battery Housing and remove pressure tube.

6. Place 3 lithium batteries DURACELL DL 123 A / 3 V or equivalent into the battery holders. Take care of **correct polarity**. Secure all batteries with retainer covers.

7. Make sure that the sealing surface in the pressure tube is clean. If necessary use a lintfree cloth for cleaning.
   Do not use absorbent cotton!

8. Slightly grease the sealing surface in the pressure tube with O-ring lubricant.

9. Make sure that the O-ring in the flange is clean and uninjured. If necessary use a lintfree cloth for cleaning.

10. If the O-ring is defective, use a blunt tool (e.g.ball point pen cartridge or a piece of wood) to take the O-ring out of the groove.
    Take care that the groove in the flange will not be damaged!

11. Make sure that the groove in the flange is clean and uninjured. If necessary use a lintfree cloth for cleaning.
    Do not use absorbent cotton!

12. Slightly grease a spare O-ring No. 120 with O-ring lubricant.

13. Put the greased O-ring into the groove of the flange.

14. Carefully press the flange into the pressure tube.

15. Fasten the flange at the pressure tube with the plastic union nut.

16. Slightly grease the pins of the underwater connectors with pin lubricant.

17. Re-establish the electrical connection between Battery Housing and Motor Unit.

18. Place the Battery Housing in its seat at the Motor Unit.

19. Fix the Battery Housing at the Motor Unit with the star grip screw.
    Do not use any tool!

20. Batteries have to be changed:

    a. Before any long term operation.

    b. When battery voltage falls below 7 V (see page 13).

PC-SOFTWARE OCEANLAB 3

The data acquisition software OceanLab 3 is an easy-to-use package for pre-deployment system set-up, real-time control of the complete system, real-time data acquisition, post-deployment data download, data processing, data visualization, data storing and data export for HYDRO-BIOS systems.

OceanLab 3 is completely configured by the HYDRO-BIOS system and thus offers all modules, functions and calibration coefficients necessary to control the system actually connected.

MINIMUM PC REQUIREMENTS
Celeron or Athlon PC 1 GHz, 2GB RAM
10 MB free space on hard-disk drive
Windows 10 / Windows 8.1 / Windows 7 / XP
Display 800 x 600 pix. minimum
1 free USB-port for serial port adaptor
2-Button Wheel-mouse

INSTALLATION
Ensure you have **Administrator Rights** for the installation.
To install OceanLab 3 at your PC start the PC and insert the supplied OceanLab USB-stick. With AUTORUN function enabled (see Windows manual) the installation will start automatically on Windows XP. If the installation process is not started automatically please select START from the Windows task bar and click on RUN. Enter the installation command "D:\Setup.exe" (where the D is the identification letter for the USB stick drive in your PC) and confirm the command with the OK button.
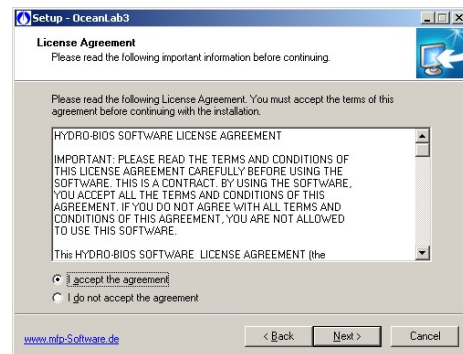
Follow the dialog box instructions to install the software. The installation directory (according to current Microsoft guidelines) is C:\Program Files (x86)\OceanLab3.

APPEARANCE OF OCEANLAB 3

OceanLab 3 consists of different program windows that can be independently modified in size and position at the Windows desktop.
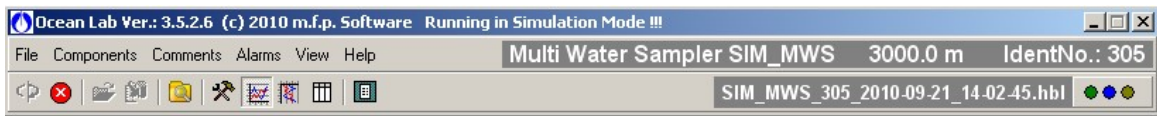
The MAIN window incorporates the toolbar and the main menu. In the upper right of the MAIN window OceanLab 3 indicates the type of system connected in clear text and the identity number (IdentNo.) of the electronics board inside the Probe resp. Motor Unit.
Additionally three LEDs indicate the communication state of OceanLab 3:

Green LED indicates that OceanLab 3 is sending commands to the HYDRO-BIOS system.
Blue LED indicates that OceanLab 3 receives data from the HYDRO-BIOS system
Yellow LED indicates that an action device inside the instrument Unit is active.

Inside the tabulated COMPONENTS window real-time measuring data received from the instrument and data calculated from the measuring data are displayed in engineering units.

During online operations the GRAPHS window visualizes a currently updated time- or pressure-depending graph with the sets of measuring data received from the instrument. Alternatively the graph can be replaced by a tabulated data list.

For system set-up OceanLab 3 offers an individual CONTROLLING dialog window for each implemented device, offering all necessary features of the specific device.

A LOGFILE EDITOR is available enabling the user to add individual header information to the active data file and to mark events of special interest inside the active data file.

COMMUNICATION / CONNECTING

The communication between the PC and the HYDRO-BIOS system is made via a serial COM-port. Feel free to connect the HYDRO-BIOS system to any COM-port available at the PC. After starting OceanLab 3 and switching on the HYDRO-BIOS system click on button CONNECT inside the toolbar or select menu item CONNECT inside the FILE menu. During the connection process OceanLab 3 uses the first free COM-port to communicate with the HYDRO-BIOS system. When OceanLab 3 is unable to establish a connection to the HYDRO-BIOS system please select the appropriate COM-port inside the pull-down table COM-PORT of the CONNECT dialog. After having successfully connected OceanLab 3 in most configurations enters the MONITORING MODE and automatically starts to store the real-time measuring data into a disk file. In some configurations OceanLab 3 may switch into the CONTROLLING MODE automatically.

The CONNECTING process can only be started when no session or simulation is active and no file is opened inside OceanLab 3.

When communication problems occur during an online mission OceanLab 3 automatically tries to re-connect and, via LOGFILE EDITOR, marks date, time and kind of communication problem inside the LOGFILES. The positions of these error comments are marked with red boxes inside the GRAPHS window of MONITORING mode and VIEWER MODULE.

To stop the data transmission from the HYDRO-BIOS system to the PC please use the button STOP SESSION inside the toolbar or inside the FILE menu.

To close the actual data file and to prepare OceanLab 3 for the next mission use button CLOSE FILE inside the toolbar or inside the FILE menu.

OPERATING MODES
To meet the different hardware constellation requirements, OceanLab 3 incorporates three different operating modes:

In MONITORING MODE currently updated real-time data received from the instrument are stored into a disk file (for later analysis) and displayed in engineering units. Additionally the MONITORING MODE offers a user configurable graph to visualize the real-time data of the instrument. All action devices of the instrument can be controlled with an ACTION button.
Please note: The MONITORING MODE is of **no use** for the MULTI SEDIMENT TRAP because it is not equipped with any sensor delivering real-time measuring data.

The CONTROLLING MODE offers a list of all devices implemented into the instrument. It is intended to control all implemented devices in view of pre-deployment system set-up and post-deployment data download.

The VIEWER MODULE of OceanLab 3 is used to view and export disk files of previous operations.
Please note: The VIEWER MODULE is of **no use** for the MULTI SEDIMENT TRAP because it is not equipped with internal data memory and thus does not deliver any useful disk files.

CONTROLLING MODE
To enter the CONTROLLING MODE click on button CONTROLLING MODE inside the toolbar.

The CONTROLLING MODE incorporates the following independent program windows:

COMPONENTS WINDOW
The tabulated COMPONENTS window offers a list of all components implemented into the actual instrument.

Since the instrument connected automatically configures OceanLab 3 the list of implemented components may vary from instrument to instrument.

Clicking at one implemented device opens an individual CONTROLLING dialog for the selected device, offering all necessary features of the specific device (e.g. real-time programming ...).
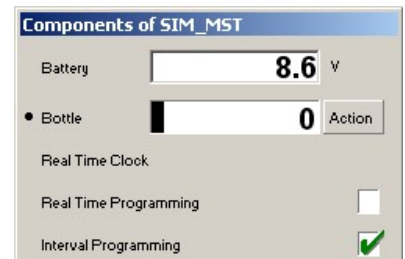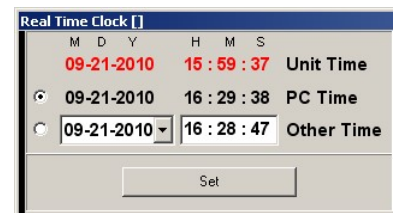
CONTROLLING DIALOG REAL TIME CLOCK
The CONTROLLING dialog REAL TIME CLOCK is used to adjust the real time clock of the instrument. The real time clock of the instrument can be synchronized with the PC clock or adjusted at will.

The date format is MM-DD-YYYY MM = month, 2 digits
                                  DD = day, 2 digits
                                  YYYY = year, 4 digits within the
interval 2000 … 2099)

The time format is: hh:mm:ss   hh = hour, 2 digits within the interval 0 … 24
                                  mm = minute, 2 digits
                                  ss = second, 2 digits

The button SET is used to transfer the new date and time to the instrument after modifications.

CONTROLLING DIALOG REAL-TIME PROGRAMMING

The CONTROLLING dialog REAL-TIME PROGRAMMING is used to programme real time depending activating events for the action device of the instrument.
Please note that REAL-TIME PROGRAMMING can only be done whilst the instruments action device is in STARTPOSITION.

The first event has to be entered as full date and time.

Date format: MM-DD-YYYY
        MM = month, 2 digits
        DD = day, 2 digits
        YYYY = year, 4 digits within the interval 2000 … 2099)

Time format: hh:mm
        hh = hour, 2 digits within the interval 0 … 24
        mm = minute, 2 digits

The button ▼ next to the date can be used to open a calendar for an easy selection of the date intended.

The following events can be programmed at will as full date and time or as time duration.
Duration format: hhhh:mm
        hhhh = hours, 4 digits
        mm = minute, 2 digits
        The duration must be less than one year (= 8760 hours)

The button ↓ next to the duration can be used to copy the actual duration to all following events.

If you enter a duration OceanLab 3 will calculate the next events date and time, if you enter date and time OceanLab 3 will calculate the next events duration.

The button SEND TO INSTRUMENT is used to transfer the activating events to the instrument after modifications.

CONTROLLING DIALOG INTERVAL PROGRAMMING

The CONTROLLING dialog INTERVAL PROGRAMMING is used to programme time depending activating events with individual duration for each event.
Please note that INTERVAL PROGRAMMING can only be done whilst the instruments action device is in STARTPOSITION.

The START TIME, which is the time interval between switching on the instrument and the first activation of the action device, has to be entered in the format:
        hhhh:mm
        hhhh = hours, 4 digits within the interval 0 … 1499
        mm = minutes, 2 digits

The DURATIONS, which are the time intervals between two successive activation events of the action device, have to be entered in the format:
        hhhh:mm
        hhhh = hours, 4 digits within the interval 0 … 1499
        mm = minutes, 2 digits

The buttons ↓ next to the durations can be used to copy the actual duration to all following events.

The button SEND TO INSTRUMENT is used to transfer the activating events to the instrument after modifications.

PROGRAMMING

This instruments configuration offers two programming functions. In this case the activation of the favoured programming function **for the instrument** is made inside CONTROLLING MODE or MONITORING MODE by clicking at the name of the programming function. This selection is permanently stored inside the instrument. A green tick inside the tick box **indicates the active programming function of the instrument**.
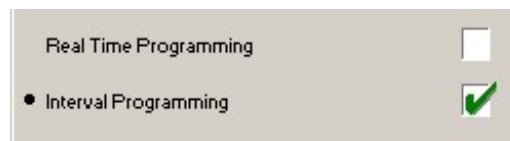
To avoid misfunctions make sure that the dummy SUBCONN DC 5 F is placed on the connector SUBCONN BH 5 M at the Motor Unit when no connection to the personal computer is intended.

1. Remove dummy SUBCONN DC 5 F from the connector SUBCONN BH 5 M of the Motor Unit.

2. Connect programming cable IL 5 F --> Sub-D 9 pin to the connector BH 5 M of the Motor Unit before switching it on.

3. Connect the programming cable to the serial COM-port of the PC.

4. Before programming make sure that the rotary table of the Underwater Unit is in start position (zero mark **0** is below the SEDIMENT TRAP).

5. Switch on the Motor Unit.

6. Start OceanLab.

7. Inside OceanLab and click on button CONNECT inside the toolbar and enter the CONTROLLING MODE.

8. Check BATTERY VOLTAGE. The batteries of the Underwater Unit should be replaced before any long term operation or when the voltage falls below 7V.

9. Select MOTOR from the list of implements and make sure that the MOTORPOSITION indicates 0 (zero).

10. Select appropriate programming function (real-time or interval programming) and enter scheduled mission.

When the MULTI SEDIMENT TRAP operates in REAL-TIME mode, it is IMPOSSIBLE to repeat a mission without re-programming the Motor Unit. Thus you have to program the Motor Unit for every single operation.

When the MULTI SEDIMENT TRAP operates in INTERVAL mode, you CAN repeat a mission without re-programming the Motor Unit. In this case you can switch off the Motor Unit after operation and switch it on again to carry out an additional operation with the same intervals.

11. Click on button SEND TO INSTRUMENT to transfer the activating events to the Motor Unit.

12. Switch off the Motor Unit.

13. Remove the programming cable (IL 5 F --> Sub-D 9 pin) from the Motor Unit.

14. Slightly grease the pins of the connector BH 5 M at the Motor Unit with pin lubricant.

15. Place the dummy DC 5 F on the connector BH 5 M at the Motor Unit and secure it with its locking sleeve.

OPERATION

Before an operation the MULTI SEDIMENT TRAP should not stand on deck at temperatures below -40°C!

1. To avoid misfunctions make sure that the dummy SUBCONN DC 5 F is placed on the connector SUBCONN BH 5 M at the Motor Unit.

2. Just before deployment the MULTI SEDIMENT TRAP is started by setting the lever switch on the outside of the Motor Unit to position **I**.

3. An interruption resp. abortion of the programme execution can be made at any time by setting the lever switch on the outside of the Motor Unit into position **O**.

4. To reset the MULTI SEDIMENT TRAP into start position after an programme abortion, follow the instruction according the chapter OPERATION WITH LESS THAN 6 COLLECTING BOTTLES, page 15.

OPERATION WITH LESS THAN 6 COLLECTING BOTTLES

To avoid misfunctions make sure that the dummy SUBCONN DC 5 F is placed on the connector SUBCONN BH 5 M at the Motor Unit when no connection to the personal computer is intended.

1. If the MULTI SEDIMENT TRAP shall 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 Motor 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 Motor 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 on button CONNECT inside the toolbar.

5. By clicking on 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 Motor Unit into position **O**.

7. Remove the programming cable to PC from the Motor Unit. Place the dummy SUBCONN DC 5 F on the connector SUBCONN BH 5 M of the Motor Unit.

8. Terminate OceanLab.

REMOVAL AND MOUNTING INSTRUCTIONS FOR THE MOTOR UNIT

To avoid misfunctions make sure that the dummy SUBCONN DC 5 F is placed on the connector SUBCONN BH 5 M at the Motor Unit when no connection to the personal computer is intended.

REMOVAL:

1. Make sure that the lever switch at the Motor 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. Remove the Motor Unit.
   Tool: Hexagon socket screw key 5 mm.

MOUNTING:

The MULTI SEDIMENT TRAP does only work properly, when the synchronization between Motor 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 Motor Unit (with Battery Housing connected) to the personal computer.

2. Switch the lever switch at the Motor Unit into position **I**.

3. At the PC start OceanLab and click on button CONNECT inside the toolbar.

4. Activate the CONTROLLING MODE.

5. Select BOTTLE from the list of implements.

6. Click once at the button HALF STEP. The axle of the Motor Unit will carry out a half revolution and the Motor Counter will be set to **0**.

7. Switch the lever switch at the Motor Unit into position **O**. Terminate OceanLab.

8. Turn the rotary table by hand until the position **0** (which can not be equipped with a collecting bottle) is located directly below the SEDIMENT TRAP.

9. Remount the Motor Unit without distorting the position of the rotary table. Remount the 3 hexagon socket screws M 6 from bottom side of the base plate. Care for a small slackness between gearwheel of the Motor Unit and the rotary table.
   Tool: Hexagon socket screw key 5 mm

10. Switch the lever switch at the Motor Unit into position **I**.

11. At the PC start OceanLab and click on button CONNECT inside the toolbar.

12. Click once at the button ACTION. The rotary table will be moved to the next position. When the rotary table has reached position **1** check the slackness between gearwheel of the Motor Unit and the rotary table.

13. Repeat this item 6 times until the revolution of the rotary table has been completed. The MOTOR Counter indicates position **7**.

14. Check that the initial position **0** is located exactly below the SEDIMENT TRAP. If not: Dismount and re-mount the Motor Unit as described above.

15. Remove the connecting cable to PC from the Motor Unit. Place the dummy SUBCONN DC 5 F on the connector SUBCONN BH 5 M of the Motor Unit.

16. Switch the lever switch at the Motor Unit into position **O**. Terminate OceanLab.

LOCALIZATION OF FAULTS

To avoid misfunctions make sure that the dummy SUBCONN DC 5 F is placed on the connector SUBCONN BH 5 M at the Motor Unit when no connection to the personal computer is intended.

1. Upon startup of OceanLab the CONNECT dialog window indicates NO DATA and does not disappear:
   Motor Unit is switched off. Switch lever switch of the Motor 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 Motor Unit is not supported by OceanLab. Use correct version of OceanLab resp. use correct Underwater Unit.
   The programming cable between Motor Unit and PC is defective. Check cable.

2. During working with OceanLab the CONNECT dialog box indicates NO DATA:
   Underwater Unit is switched off. Switch lever switch of the Motor Unit into position **I**.
   Batteries of the Underwater Unit are exhausted. Install new batteries.
   The programming cable between Motor Unit and PC is defective. Check cable.

3. A correct programmed Motor Unit did not execute the mission:
   Batteries of the Underwater Unit are exhausted. Install new batteries.
   The dummy SUBCONN DC 5 F has not been placed upon the connector SUBCONN BH 5 M at the Motor Unit. Before an operation make sure that the connector SUBCONN BH 5 M at the Motor Unit is protected by the dummy SUBCONN DC 5 F.
   All real-time depending activating events had passed when the Motor Unit has been switched on for the operation. Repeat the mission with a new program with correct dates and times.
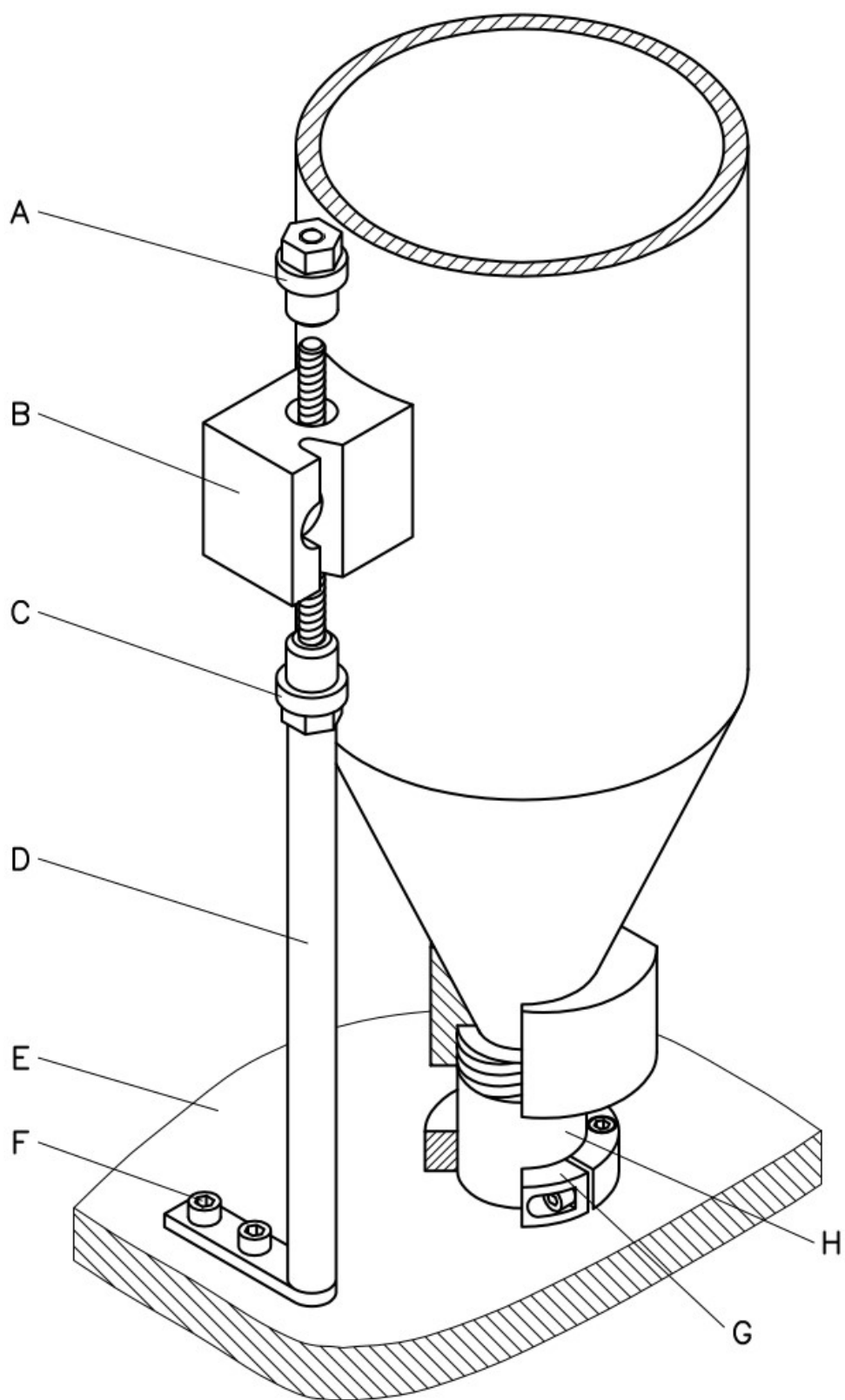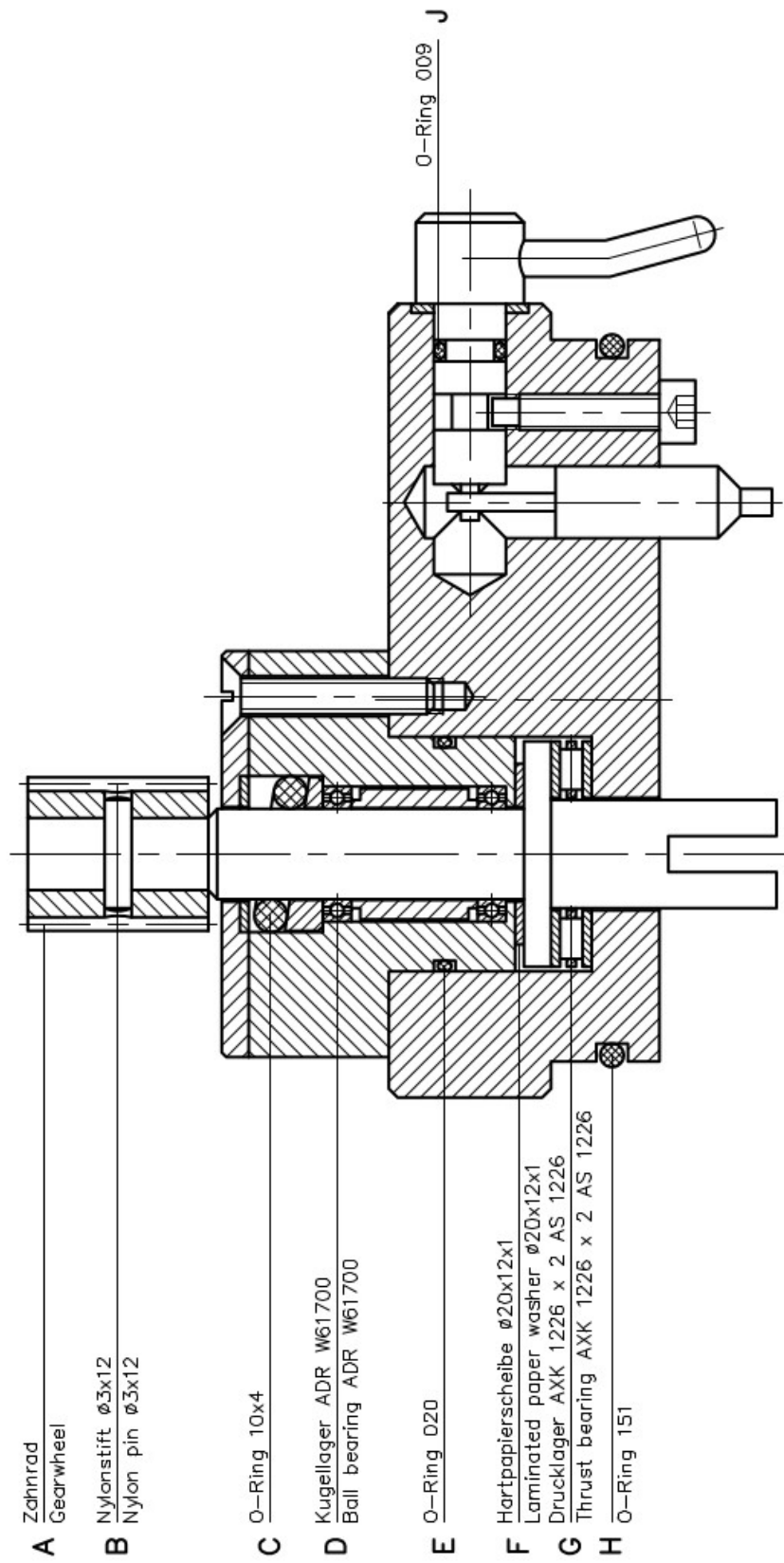
A

B

C

D

E

F

G

H

Fig. 1

J O-Ring 009

A Zahnrad
  Gearwheel

B Nylonstift ∅3x12
  Nylon pin ∅3x12

C O-Ring 10x4

D Kugellager ADR W61700
  Ball bearing ADR W61700

E O-Ring D20

F Hartpapierscheibe ∅20x12x1
  Laminated paper washer ∅20x12x1

G Drucklager AXK 1226 x 2 AS 1226
  Thrust bearing AXK 1226 x 2 AS 1226

H O-Ring 151

Fig. 2