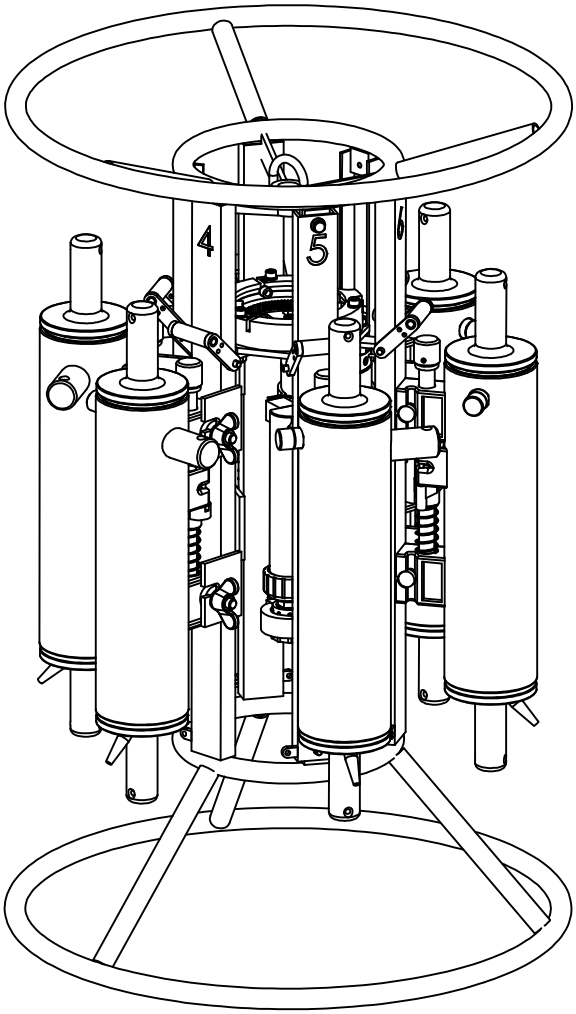


MULTI WATER SAMPLER MWS OEM

to be controlled by CTD probes

OPERATION MANUAL

Product ID 436 836 – 436 854

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SAFETY INSTRUCTIONS

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 follow this 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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TERMINOLOGY

motor unit: pressure housing with electronics and motor

underwater unit: underwater device with mounted motor unit

probe housing: pressure housing with electronics (instruments without motor)

GENERAL DESCRIPTION

The **MULTI WATER SAMPLER (MWS)** is an instrument designed for the collection of water samples in successive or different water layers. **OEM** is a variant to be controlled by third-party CTD-probes only.

All MWS consist of a stainless steel underwater array to which 6, 12 or 24 plastic water samplers with various capacities can be mounted (see list in chapter TECHNICAL DATA, page 6).

The **MWS 6** SLIMLINE is a lightweight, improved version of the MULTI WATER SAMPLER. The small dimensions allow easy handling even on small research vessels. Other configurations are **MWS 12** and **MWS 24**.

Communication with the CTD-probe is made via a bi-directional serial interface (RS232), connector type SUBCONN MC BH 3 F.

Components:

The **MWS** is equipped with a motor-driven release device - the water samplers are closed in succession of their mounting to the array (i.e. no. 1, 2, 3 …).

Power supply of the motor unit is made by 3 long-lasting lithium batteries placed in a removable battery housing.

STANDARD EQUIPMENT

1. 1 Stainless steel underwater array, motor unit and battery housing made of titanium, standard operational depth 3000 metres
2. 1 Connecting cable to CTD-probe (MC IL 3 F – 1.2 m – MC IL 3 M)
3. 1 PC to serial cable: SUBCONN MC IL 3 M – 2 m – USB
4. 1 Spare O–ring 10 x 4 for axle duct Fig. 4 C
5. 1 Spare O–ring no. 020 for axle box case Fig. 4 E
6. 1 Spare O–ring no. 151 for pressure housing Fig. 4 H
7. 1 Spare O–ring no. 009 for switch shaft Fig. 4 J
8. 1 Spare O–ring no. 120 for battery housing
9. 1 Can O-ring lubricant
10. 1 Can pin lubricant
11. 3 Lithium batteries DURACELL DL 123A / 3 V or equivalent
12. 1 Dummy connector MC DC 3 M
13. 1 Box spanner 10 mm
14. 1 Hexagon socket screw key 2.5 mm
15. 1 Hexagon socket screw key 5 mm
16. 1 Operation manual
17. 1 USB flash drive OceanLab
18. 3 Battery clips

TECHNICAL DATA

	Product ID	Suitable samplers	Dimensions dia x height [cm]	Weight [kg]	Cable breaking load [daN]
MWS 6					
	436 838	1.7 l, 5 l	66 x 98	55	1000
	436 837	3.5 l	65 x 88	45	1000
	436 836	1 l	55 x 83	40	1000
MWS 12					
	436 842	1.7 l, 2.5 l, 5 l	110 x 125	75	3500
	436 843	10 l PWS, 10 l Free Flow	110 x 160	95	3500
MWS 24					
	436 854	1.7 l, 2.5 l, 5 l, 10 l PWS, 10 l Free Flow	180 x 160	200	11000

Materials:

Underwater array:	stainless steel
Motor unit:	titanium
Battery housing:	titanium
Water samplers:	uPVC

Operational depth:

Standard:	3000 m
Option:	6000 m

NOTICE

To avoid damage do not exceed the maximum operational depth of the instrument!

Power Supply:

Battery type: 3 Lithium batteries: Duracell DL 123 A or equivalent;
Capacity sufficient for approx. 100 hours of operation at 1 Hz measurement interval.

Interface for CTD-probe:

Type:	RS232
Configuration:	1 start bit, 8 data bits, 1 stop bit, no parity
Transfer rate:	38400 bps
Connector:	MC BH 3 F
Pin assignment:	Pin 1: Ground (GND)
	Pin 2: Receive data (RxD of RS232)
	Pin 3: Transmit data (TxD of RS232)

Electronics operating temperature range: -40° C...+85° C

COMMAND SET OF PROBE INTERFACE

COMMUNICATION

Communication is always initialized by the device controlling the Multi Water Sampler (MWS). Every command received by the MWS will be acknowledged with a reply to the controlling device. Between commands a pause of at least 100 ms must be inserted to allow for processing and recovery from a transmission fault in noisy environments. Invalid commands will be ignored and not be acknowledged.

COMMAND STRUCTURE

Byte 0	Number of bytes in command
Byte 1, 2	Address of component for this command
Byte 3	Command code
Byte 4 … (n-1)	Data
Byte n	Checksum (summation of all previous bytes in this command)

COMMANDS

The command set always describes the command sent by the CTD probe first, followed by the reply of the motor unit of the sampling system.

ACTION (close next water sampler)

Bytes to be sent to sampler:	5 – 0 – 104 – 128 - 237
Response by sampler:	5 – 0 – 104 – 129 - 238

Notice: This command will be ignored while motor is running or motor has reached the end position.

HALF STEP (carry out a half revolution of the motor axle and set the motor counter to zero)

Bytes to be sent to sampler:	5 – 0 – 104 – 130 - 239
Response by sampler:	5 – 0 – 104 – 131 - 240

Notice: This command will be ignored while motor is running.

RESET COUNTER (set motor counter to zero)

Bytes to be sent to sampler:	5 – 0 – 104 – 132 – 241
Response by sampler:	5 – 0 – 104 – 133 - 242

Notice: This command will be ignored while motor is running.

CONFIGURATION (request number of water samplers)

Bytes to be sent to sampler:	5 – 0 – 104 – 134 – 243
Response by sampler:	6 – 0 – 104 – 135 – n_max - checksum
Where:	n_max indicates the number of bottles

DATA (request full data set)

Bytes to be sent to sampler:	5 – 0 – 0 – 18 - 23	
Response by sampler:	8 – 0 – 0 – 21 – status - battery - n - checksum	
Where:	Status = 0:	motor is NOT active
	Status = 1:	motor is active
	Battery = 0 … 255:	battery voltage in decivolts (0.0 V … 25.5 V)
	n = 0 … n_max:	number of last closed water sampler

PREPARATION

ELECTRICAL CONNECTION TO CTD-PROBE

1. Make sure that the motor unit and the CTD-equipment are switched off.
2. Remove dummy connector from socket MC BH 3 F at the motor unit.
3. Slightly grease contacts of the connector MC IL 3 M of the connecting cable to CTD-probe with pin lubricant and connect it to the socket MC BH 3 F at the motor unit.
4. Secure connector MC IL 3 M with its locking sleeve at the socket MC BH 3 F at the motor unit.

SAMPLER AND WIRING TEST

This test should be carried out:

- prior to first deployment of the MWS on any vessel or with any CTD equipment
- after any changes / work / maintenance on related shipside wiring, winch, slip ring, wet end terminator of electromechanical cable
- when MWS and / or winch have not been used for an extended period of time

In order to check the function of CTD-probe in conjunction with motor unit and single- or multi conductor cable the following steps have to be carried out:

> ***CAUTION***
>
> **PINCH POINT!**
> TO AVOID INJURY TO THE OPERATORS OR DAMAGE TO THE INSTRUMENT CAUSED BY CLOSING OF THE SAMPLERS ON AIR THE SAMPLERS MUST **NEVER** BE ARMED DURING TESTS!

> ***NOTICE***
>
> Make sure no other electrical / electronical equipment is actively using the abovementioned electrical connections during test or operation of the MWS. Failure to do so may result in loss of data and / or damage to equipment.

1. Switch the lever switch at the underwater unit into position **O** (Fig. 1 F).
2. Remove dummy connector SUBCONN MC DC 3 M from the underwater unit.
3. Slightly grease the pins of all underwater connectors of the underwater unit and the adaptor cable with PIN-lubricant.
4. Connect adaptor cable MC IL 3 M – MC IL 3 F to the connector MC BH 3 F on the underwater unit.
5. Connect adaptor cable to the CTD-probe.
6. Lift the striking bar **J** of the rack no. 1 and put rope **D** with the plastic ball **C** into the corresponding slot no. 1 (Fig. 1, Fig. 2) **but do not arm the samplers**.

> ***CAUTION***
>
> **PINCH POINT!**
> **Keep hands and fingers clear.**

7. Repeat this procedure for the remaining racks.
8. Switch the lever switch at the motor unit into position **I**.
9. Switch on the CTD equipment.

10. Carry out the ACTION command.

> **WARNING**
>
> 
>
> MOVING PARTS CAN CRUSH AND CUT!
> Keep hands and fingers clear.

11. Repeat the procedure for the remaining racks. Finally the CTD-equipment indicates the last water sampler no. 6, 12 or 24 has closed. A complete operation has been simulated. The red releaser block (Fig. 1 B) is now located between slot no. 1 and slot no. 6, 12 or 24. Upon reaching the end position no further ACTION commands can be carried out. To return the motor unit into its start position the motor unit has to be switched off and on again
12. Switch off underwater unit.
13. Switch off the CTD equipment.
14. To avoid corrosion at the contacts of the connectors the contacts should be slightly greased with pin lubricant and always be protected with their respective dummy connectors when no electro-mechanical cable is connected.

If this test passes the data connection is ready.

1. Lift the striking bar **J** of the rack no. **1** and put rope **D** with the plastic ball **C** into the corresponding slot no. **1** (**Fehler! Verweisquelle konnte nicht gefunden werden.**).

⚠CAUTION



PINCH POINT!
Keep hands and fingers clear.

2. Repeat this procedure for racks no. **2** to no. **6**.
3. Open water samplers as described on the label (**Fehler! Verweisquelle konnte nicht gefunden werden.**). Carry out **steps 1** to **4**.
4. Just before deployment the **MWS** has to be switched on by setting the lever switch at the outside of the motor unit into position **I**.
5. Switch on the CTD-equipment.
6. Lower the MWS to the greatest scheduled depth and stop winch.
7. Close the first water sampler via the CTD-equipment.
8. Heave the MWS to the next depth and stop winch again.
9. Close second water sampler via the CTD-equipment.
10. Repeat this procedure for the remaining water samplers. Upon reaching the end position no further ACTION commands can be carried out.
11. When the **MWS** is back on deck set the lever switch to **O** (zero).
12. Switch off the CTD equipment.
13. Rinse the instrument with fresh water.

MAINTENANCE

UNDERWATER CONNECTORS

The underwater connectors need just a little care to ensure a long life-span. However, it is advisable to grease the sealing surfaces of the pins with pin lubricant. This avoids corrosion of the contacts and reduces wear while plugging and unplugging.

To conserve the cable connectors never unplug by pulling on the cable and avoid bending radiuses above all narrow, sharp edges.

NOTICE

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

Clean underwater connectors with warm soapy water. Avoid chemicals to get in contact with the connectors.

BATTERY CHANGE

1. Make sure that the lever switch at the outside of the motor unit is switched into position **O** (Fig. 1 F).
2. Unplug the cable connection between battery housing and motor unit.
3. Loosen the battery housing from the motor unit by screwing the star grip screw counter-clockwise and take the battery housing into a dry room.
4. Unscrew the union nut from the battery housing and remove pressure tube.
5. Place 3 lithium batteries DURACELL DL123A / 3 V or equivalent into the battery holders. Observe **correct polarity**. Secure all batteries with retainer covers.
6. Make sure that the sealing surface in the pressure tube is clean and undamaged. 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 remove 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.
12. Slightly grease the pins of the underwater connectors with pin lubricant and re-establish the electric connection between battery housing and motor unit.
13. Place the battery housing in its seat at the motor unit.
14. Fix the battery housing to the motor unit with the star grip screw.

NOTICE

Do not use any tool when fastening the grip screw!

REMOVAL OF THE MOTOR UNIT

1. Unplug the cable from the motor unit, if any.
2. Unscrew rack(s) near the motor unit from the MWS (MWS 6: rack no. 1; MWS 12: rack no. 12; MWS 24: racks no. 1, 2, 24). Tool: box spanner 10 mm. The sampler may remain on the rack.
3. One person has to hold the motor unit, the second one unscrews 3 hexagon socket screws M 6 (Fig. 1 G). Tool: hexagon socket screw key 5 mm.
4. Remove the motor unit.

MOUNTING OF THE MOTOR UNIT

The underwater unit only works properly if the synchronization between motor and gear has been established. The synchronization is not in order if

a) the driving toothed wheel of the motor has been turned electrically or mechanically in dismounted condition.
b) the red releaser block is not positioned between slot no. 1 and the last position (MWS 6: no. 6; MWS 12: no. 12; MWS 24: no. 24) of the internal gear ring (Fig. 1 B).

In order to re-establish the synchronization before mounting the following steps have to be carried out:

1. Connect removed motor unit to the CTD-probe.
2. Switch the lever key on the motor unit into position **I** (Fig. 1 F).

3. Switch on the CTD equipment.

4. Carry out the command HALF STEP (if provided by the CTD-equipment). The motor axle will do a half revolution and set the motor counter to zero.

WARNING



MOVING PARTS CAN CRUSH AND CUT!
Keep hands and fingers clear.

Alternatively:
Carry out the **ACTION** command repeatedly until the CTD-equipment indicates the last water sampler no. 6, 12 or 24 has been closed.

5. Turn the red releaser block by hand until it is positioned between slot no. 1 and no. 6, 12 or 24 of the internal gear ring (Fig. 1 B).

6. The red releaser block has to be as close to the plastic ball C of bottle no. 1 as possible without actual contact.

7. Mount the motor unit with the 3 hexagon socket screws M 6 and 3 distance sleeves without distorting the position of the red releaser block. Make sure a small slackness between gear wheel of the underwater unit and the internal gear ring is noticeable. Tool: hexagon socket screw key 5 mm

8. Carry out a SAMPLER AND WIRING TEST (see page 10).

LOCALIZATION OF FAULTS

NO DATA

Symptom: After switching on the motor unit the CTD probe does not receive any reply from the motor unit.

Measures:

THE BATTERIES INSIDE THE EXTERNAL BATTERY HOUSING ARE EXHAUSTED. INSTALL NEW BATTERIES (SEE UNDERWATER CONNECTORS

The underwater connectors need just a little care to ensure a long life-span. However, it is advisable to grease the sealing surfaces of the pins with pin lubricant. This avoids corrosion of the contacts and reduces wear while plugging and unplugging.

To conserve the cable connectors never unplug by pulling on the cable and avoid bending radiuses above all narrow, sharp edges.

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

Clean underwater connectors with warm soapy water. Avoid chemicals to get in contact with the connectors.

- BATTERY CHANGE, page 13).
- The battery cable is defective. Check and repair or replace battery cable.

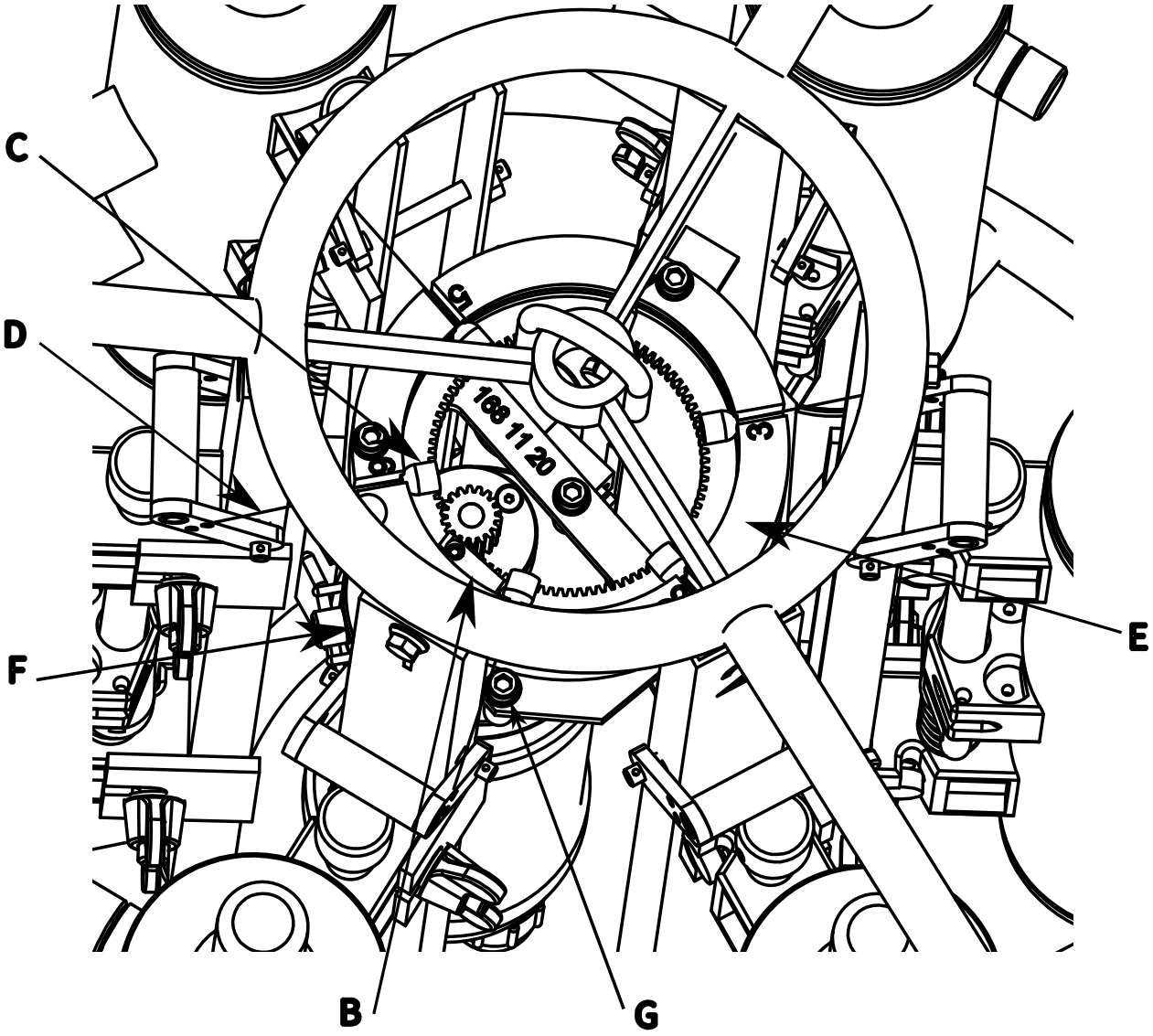


Fig. 1: top view

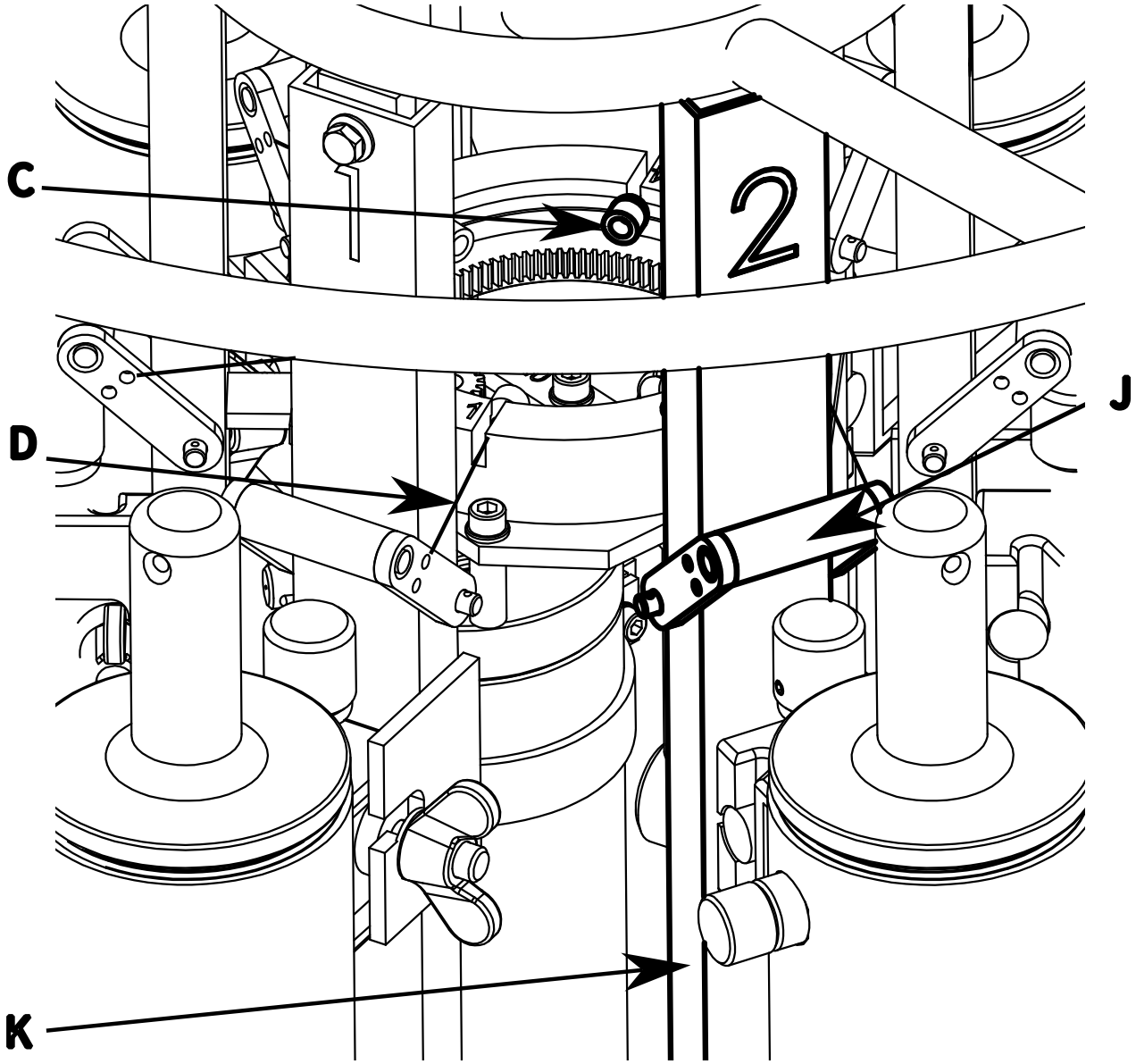


Fig. 2: view striking bar

DO NOT RELEASE SAMPLER ON AIR!

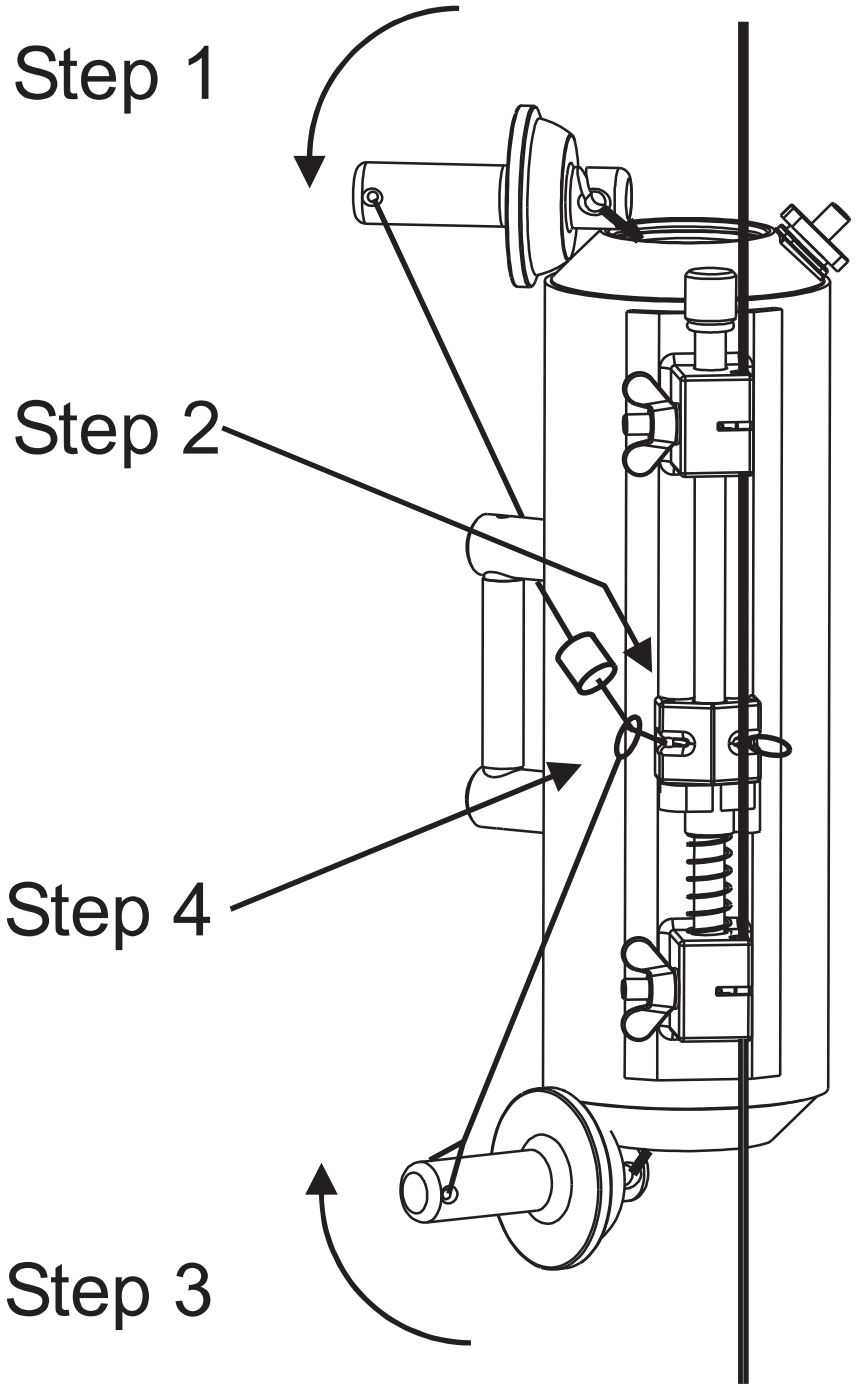


Fig. 3: arming of water sampler

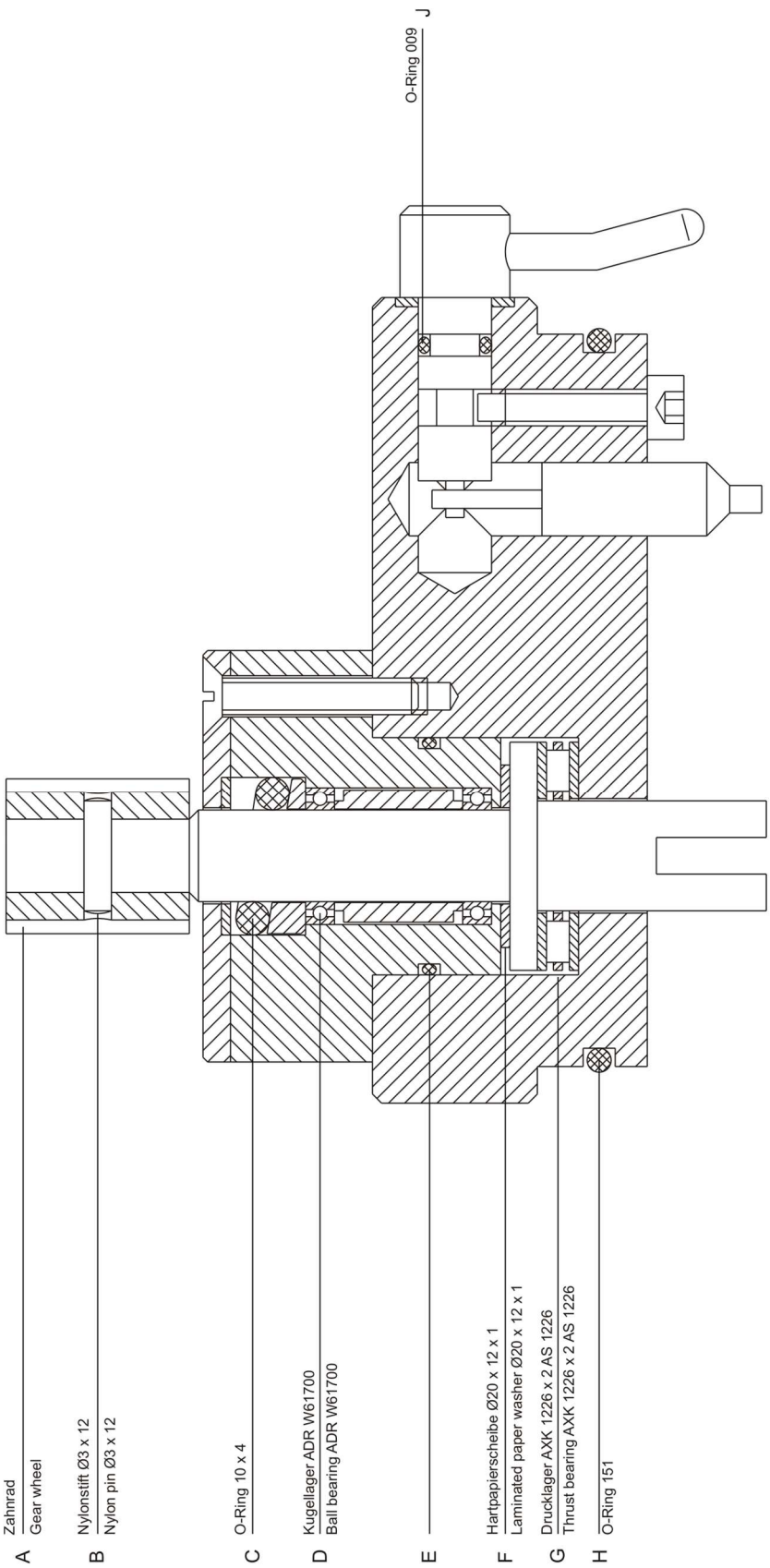


Fig. 4: O-ring configuration

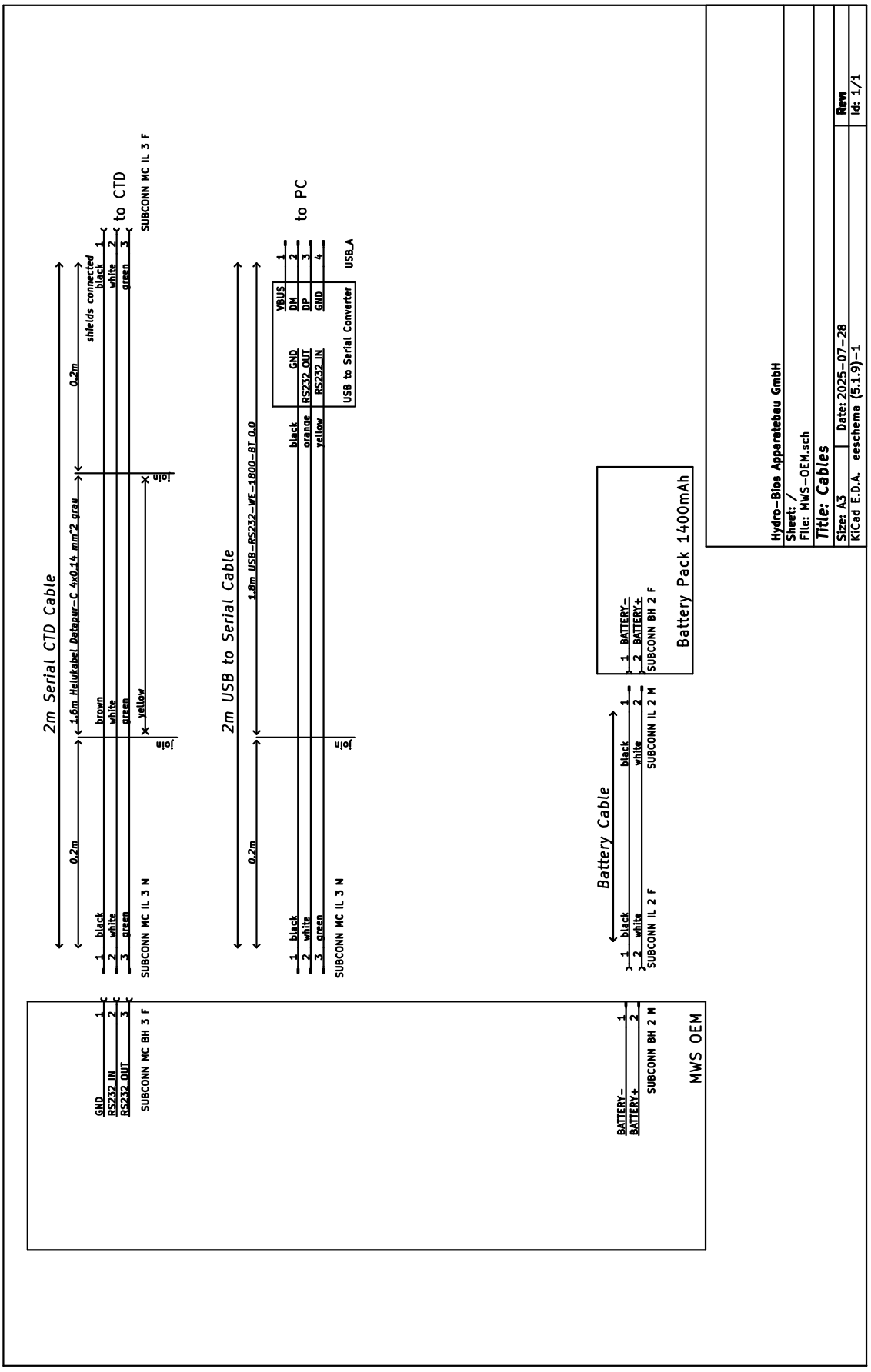


Fig. 5: connection diagram / pin configuration