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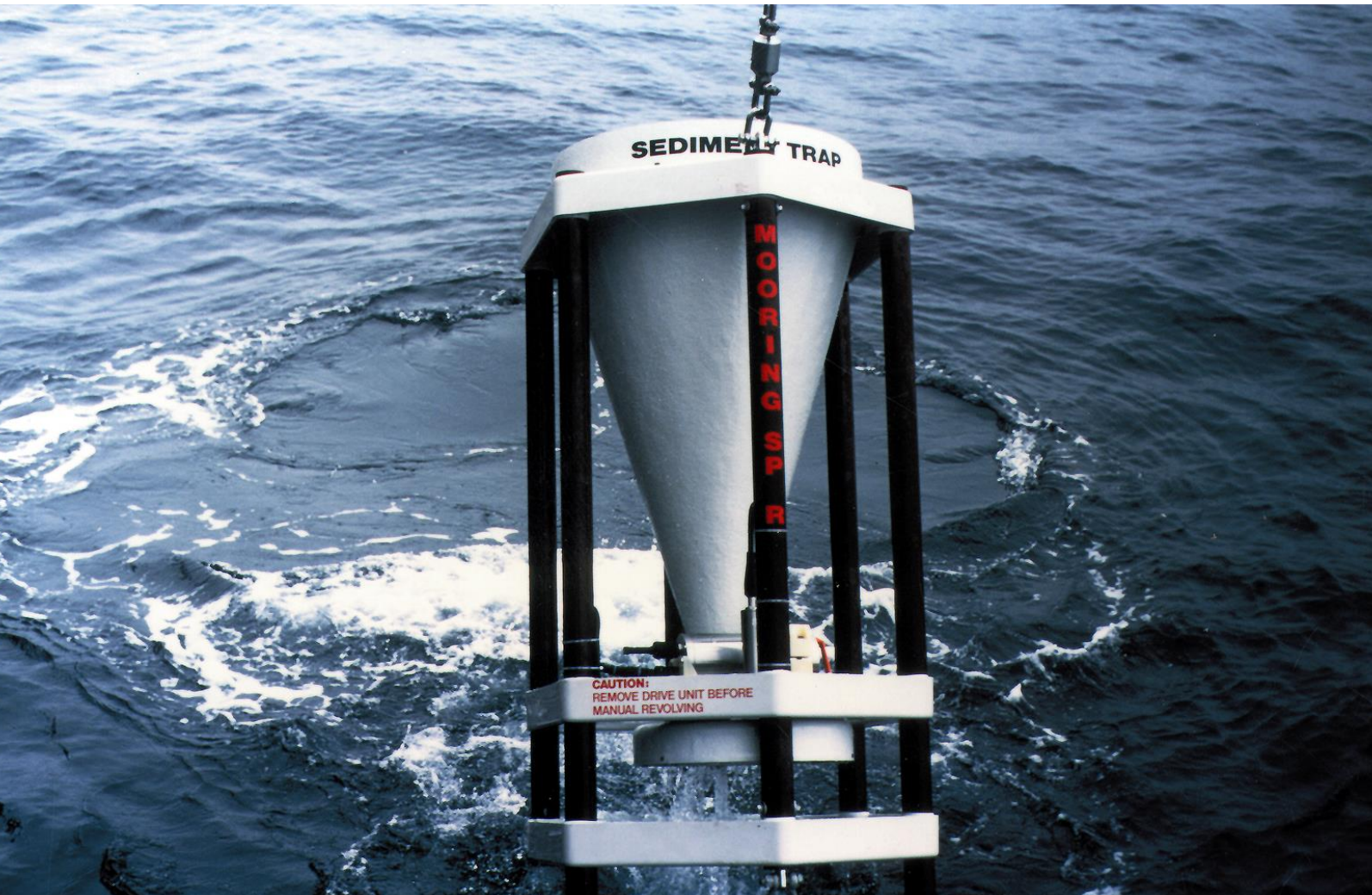
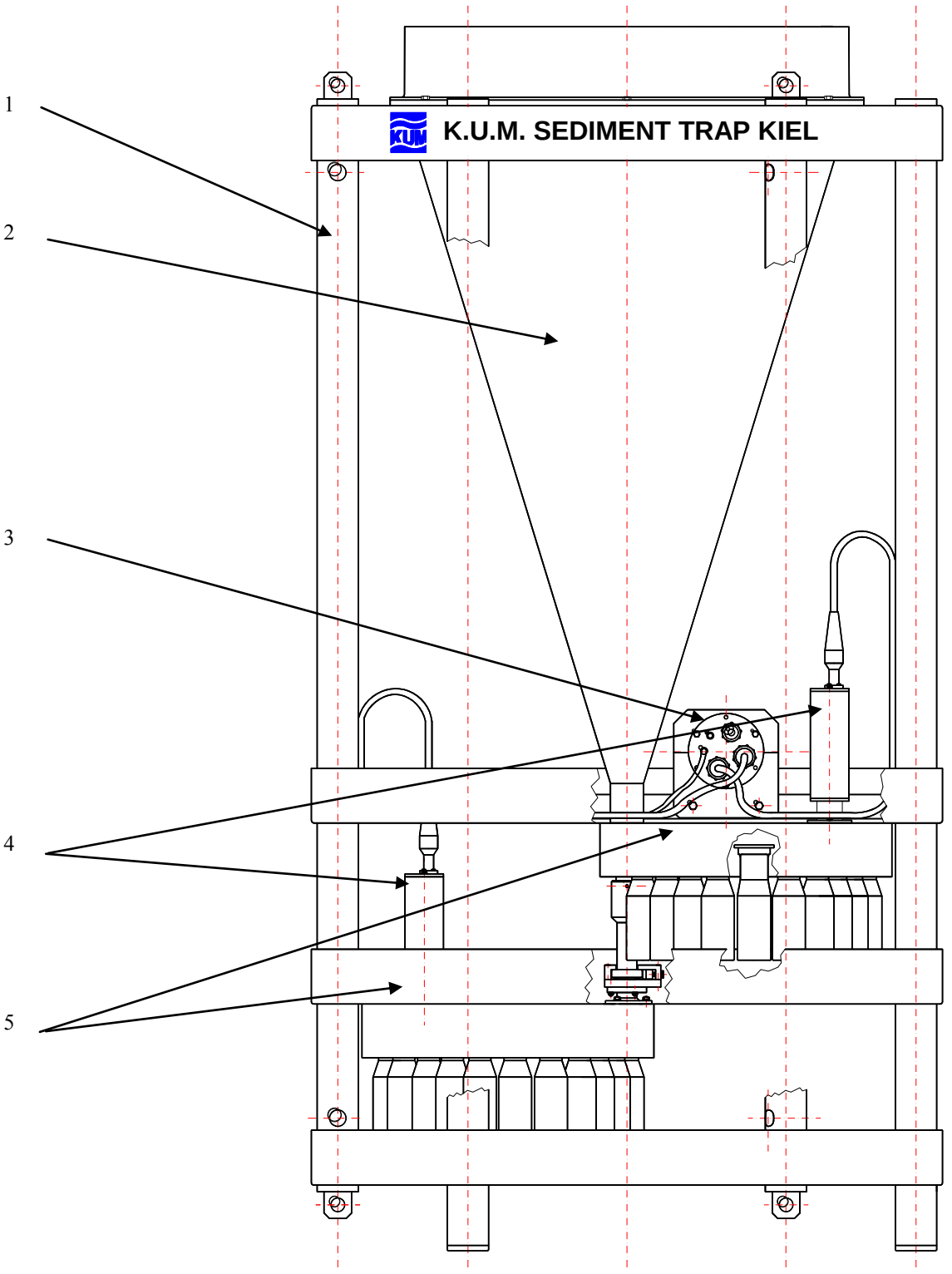
SEDIMENT TRAP

Manual 2018





1 Frame
2 Conus with protection
3 Electronics and batteries
4 Drive Unit
5 top and bottom sample unit

1. GENERAL INSTRUCTIONS

1.1 GENERAL SAFETY REGULATIONS

The legal Regulations for Prevention of Accidents are decisive for maintenance and repair work.

The corresponding operating instructions must be observed for work with the lifting jack or crane.

The individual components must be marked prior to each repair.

In order to avoid corrosion, only use unobjectionable tools of bronze or special steel 1.4539 when changing the battery as well as during maintenance and repair work. In principle, only use new sealing and locking elements for the assembly of devices.

Do not assemble screw connections when dry (lubrication).

Use specified lubricants only.

All maintenance and repair work may only be performed by personnel with the appropriate special training.

The system has to be checked for operational ability after every maintenance and repair work.

Instructions for Cables and Lines

When disconnecting plug connections, existing caps on plugs and sockets must be fitted in order to avoid humidity and foreign substances as well as damage to the contacts.

Flexible supply lines and connecting cables must not be submitted to undue tensile stress during operation and transportation of the devices. Special care has to be teken that the devices are not suspended by means of supply lines and that plugs are not unplugged from the sockets by pulling them out using the line.

Instructions for Plug Devices

Movable electrical devices (e.g. personal computer) may only be connected by means of the provided plug devices (plug, socket).

The application of adapters and plugs together with sockets of another voltage is inadmissible.

Plugs must not be drawn under load.

1.2 COMMENTS ON THE MANUAL

1.2.1 Preface

The present manual has been drawn up as a description and reference book. It will help you to answer questions and to solve problems in the quickest possible manner.

Please read the user's manual carefully if you have problems with your Sediment Trap.

For this purpose refer to the table of contents and read the corresponding section attentively. Should an error message appear on the display, please check all connections and refer to the detailed descriptions of the error messages in section 4.11.

If you have any further questions, please contact us under the following address stating the serial number :

1. email: info@kum-kiel.de

2. by letter to:

   K.U.M. Umwelt- und Meerestechnik Kiel GmbH
   Wischhofstr. 1-3 Geb. 15
   24148 Kiel
   Germany

3. in very urgent cases by phone under:

   Central office: Tel. +49(0)431/7209220

   You should always have the manual at hand.

4. FAX: +49(0)431/7209244

2. TECHNICAL DESCRIPTION K/MT 320 – K/MT 234 – K/MT 236

2.1 TECHNICAL DATA

Working depth:	max. 6000 m (max. 1000m)
Operating time:	at least 24 months using fully charged batteries
Number of samples:	max. 41 *(max. 21 **/ max. 14 ***)
	Contents of sample bottle: 400 ml ,14 oz.
Multi-sample changer:	microprocessor-controlled, interval between 2 samples is programmable between 1 minute and 24 months (clock, calendar)
Current supply:	9 V DC, using 12 Mono type 1.5 V, alkaline LR20/AM1 dry batteries (using 6 batteries **/***)
- Collecting surface:	0.5 m^2 */** (0.25 m^2***)
- Hopper angle:	34°
- Hopper height:	1313 mm */** (940 mm***)
- Hopper diameter:	800 mm */**(565 mm***)
Total height:	2230mm * (1900 mm ** / 1480 mm***)
Width:	1146 * (1079 mm ** / 910 mm***)
Material:	FRP sealed with special resin
Shape of casing:	hexagonal, employment of several traps in interconnected operation possible
Fastening:	a) one-sided suspension b) 3-point suspension for crowfoot (option)
Admissible temperature ranges:	
Operation:	-10 °C up to +40 °C
Storage and transport:	-30 °C up to +70 °C

Serial Number

* K/MT 320 **K/MT 234 ***K/MT 236

2.2 SHORT DESCRIPTION OF DEVICES

The Sediment Trap serves to investigate the vertical particle flow in a water column (as a function of place and time) and can be used both in the ocean and in inland waters.

The Sediment Trap is moored at a specified water depth and stores the sinking down substances in a sample bottle. The substances sinking down above the Sediment Trap are collected by a hopper and filtered into a sample bottle underneath it. Another sample bottle is pushed under the hopper after a pre programmed time interval. This bottle, on the other hand, collects the sediments falling into the hopper during a pre programmed period of time. When the first 20 bottles are filled a coupling is pushed under the hopper to fill the second level (only K/MT 320) of 20 bottles (fig. 1, p.2-5).

In a processor-controlled sample changer, up to 41 sample bottles can be installed for Sediment Trap K/MT 320, 21 sample bottles for K/MT 234, and up to 14 sample bottles for types K/MT 233 and K/MT 236. The dwelling period of the individual sample bottles below the hopper is programmable between 1 minute and 12 months. By means of a special construction it is guaranteed that those sample bottles not under the hopper are sealed against the outer medium.

The Sediment Trap consists of the following main groups: (p.III):
- frame construction
- hopper with cover
- sample changer (K/MT 320 first and second changer)
- control unit inclusive optional inclinometer and with batteries
- drive unit

The open frame construction keeps the flow resistance as low as possible and serves to receive the hopper and the sample changer. The special hexagonal shape admits the employment of several traps in interconnected operation. The material is a high-tensile FRP with specially sealed surface.

The hopper fixed to the frame construction serves to collect the sediments. The sediments passed through the grating are collected and passed through the funnel to the sample bottles below the hopper. A hexagonal honeycomb-network of sealed special paper, used at the same time as the straightening blade, serves as hopper cover and to prevent flushes. Furthermore, it prevents the entry of larger particles that could block the opening of the sample bottle.

The sample changer consists of a base plate, below which the sample bottles are circularly arranged on a traveller ring. A motor positions the various sample bottles below the exit port of the hopper. The sample changer is made from seawater-resistant plastic.

Programmable microprocessor electronics control the turn-table. Programming is menu-guided via a commercial IBM compatible personal computer or laptop. The Sediment Trap is connected via an RS 232 standard interface. After programming has been performed, the Sediment Trap is put into sleeping mode and can then be disconnected from the PC. Thus, even on-shore programming is possible. After termination of employment, data can be saved and printed.

The control unit contains the batteries and is mechanically separated from the drive. They are connected to each other via a pressure-watertight plug connection. The control unit is fixed above the multi-sample changer in horizontal position. This guarantees an easy mounting and dismounting for programming, exchanging the battery and maintenance.

The control unit is also available with integrated inclinometer. In case the Sediment Trap is tilted bevause of heavy currency of bad sea-bottom, the tilt is logged with the time. After recovery and using the recorded tilt one can calculate the effective collecting surface to eliminate the error.

2.3 TECHNICAL DESCRIPTION OF THE MECHANICS

2.3.1 Set-up of Frame Construction

The set-up of the Sediment Trap is shown in Fig. 1.

The frame construction consists of maintenance-free FRP sealed with special resin and is composed of:

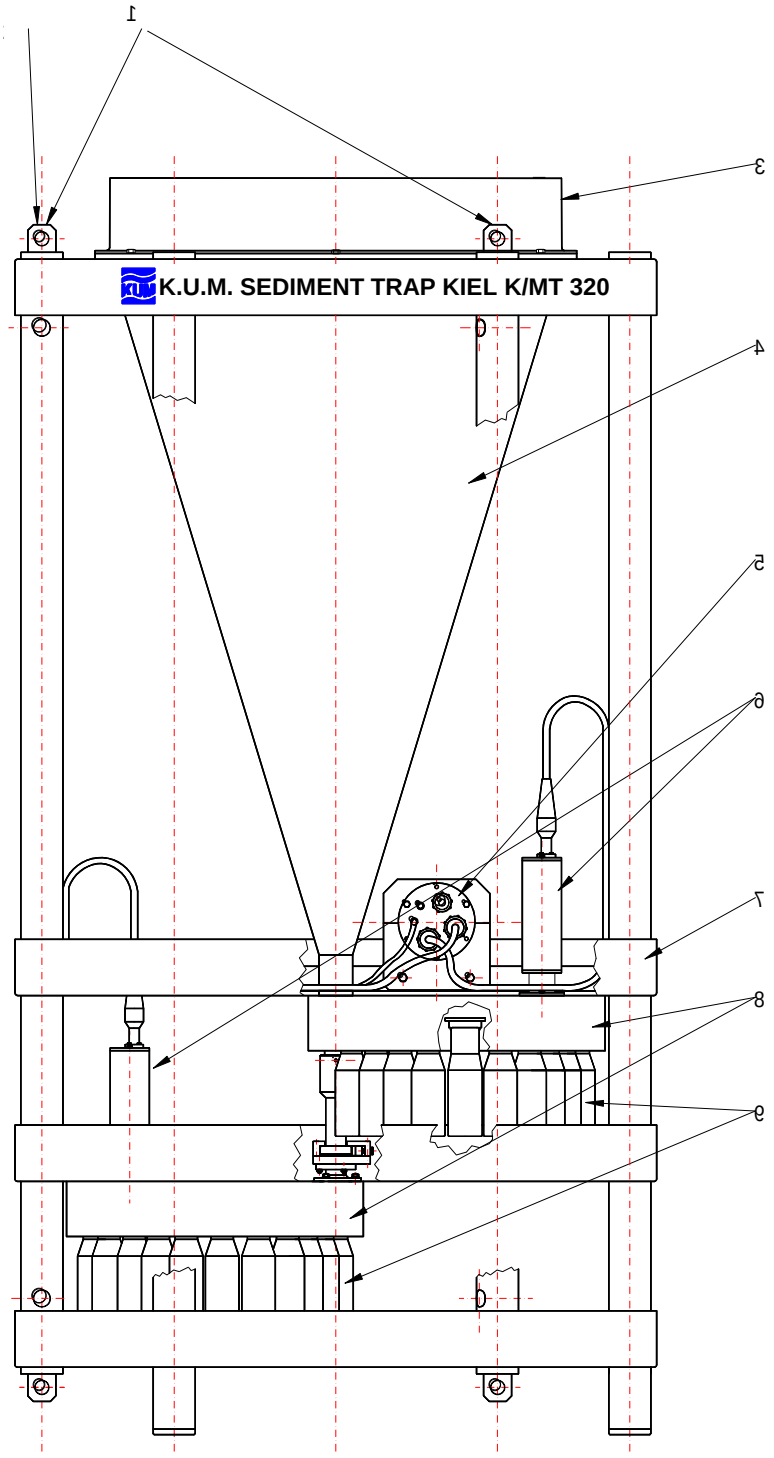
- honeycomb network as hopper cover
- hopper
- plastic pipe connections
- -frame segments

The hopper cover (Fig. 1. 3) is round and has a diameter of 565 mm for the small Sediment Trap K/MT 236 and a diameter of 800 mm for large Sediment Traps K/MT320, K/MT 233 and K/MT 234. A hexagonal honeycomb-network (strainer) of sealed special paper has been inserted into the opening of the hopper as a screen grid.

The hopper (Fig. 1. 4), as the main component of the Sediment Trap, is arranged in the centre of the frame construction. The interior surfaces are smooth in order to facilitate the gliding down of the sediments. The hopper outlet leads directly into an opening of the sample changer (Fig. 1,.8), below which the sample bottle (Fig. 1. 9) currently to be filled is arranged.

The casing consists of an open frame construction in order to keep the flow resistance as low as possible. The intermediate bottoms are joined by six plastic pipes, onto which even the fastenings for the mooring can be screwed. The mooring is effected on one side or by means of a three-point fastening (crowfoot). The three-point fastening is optional and can be ordered separately from the manufacturer. In order to trim the Sediment Trap, the control unit (Fig. 1.5) can optionally be fastened to two opposite points on the intermediate bottom. In this manner, trimming by means of buoyancy bodies is not necessary. Regarding the crowfoot suspension, the fastening of the control unit is effected opposite to the drive unit (Fig. 1.6), and in case of one-sided suspension on the drive unit side.

BEWARE: In case of one-sided suspension of the Sediment Trap, the specially marked “MOORING SPAR” must be used.



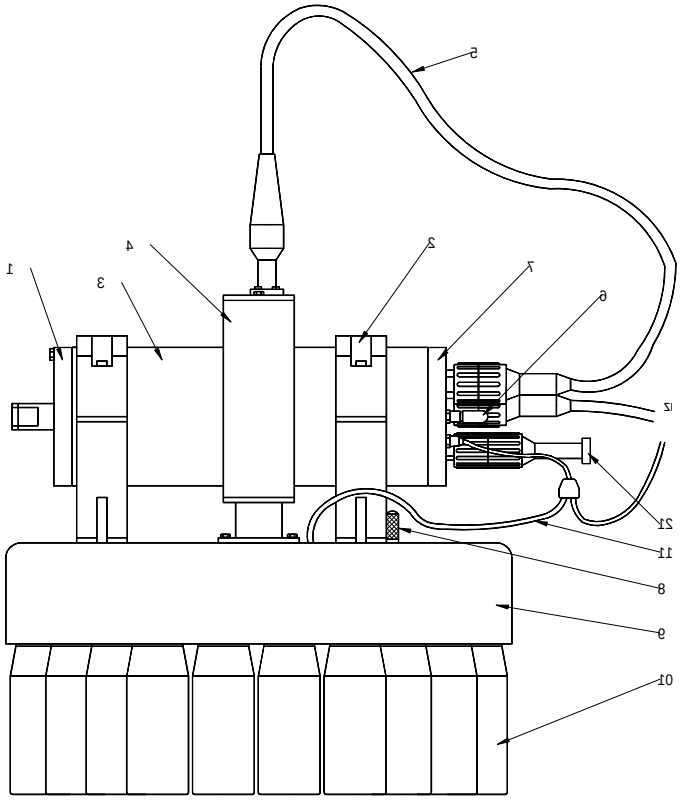
1 crowfoot fastening
2 one-sided fastening (reinforced spar)
3 hopper cover
4 hopper
5 control unit
6 drive unit (Model 234 and 236: just one unit)
7 intermediate bottom
8 sample changer (Model 234 and 236: just one unit)
9 sample bottles

Fig 1: Set up of Sediment Trap

2.3.2 Structure of the Sample Changer

The structure of the sample changer is shown in Fig. 2 and in the sectional representation of Fig. 3.

The sample changer is composed of the turntable (Fig. 2.9), the control unit (Fig. 2.3) and the drive unit (Fig. 2.4). The drive unit is electrically connected to the control unit by a pressure-watertight cable (Fig. 2.5). The connection for programming by a PC via a serial port (Fig. 2.6) is also performed on the control unit. The control unit can also be supported by external batteries. The upper turntable is fastened to the upper intermediate bottom from below, the lower turntable is fastened to the lower bottom. The control unit and the drive unit are mounted from above. Power is supplied by alkaline batteries within the control unit.

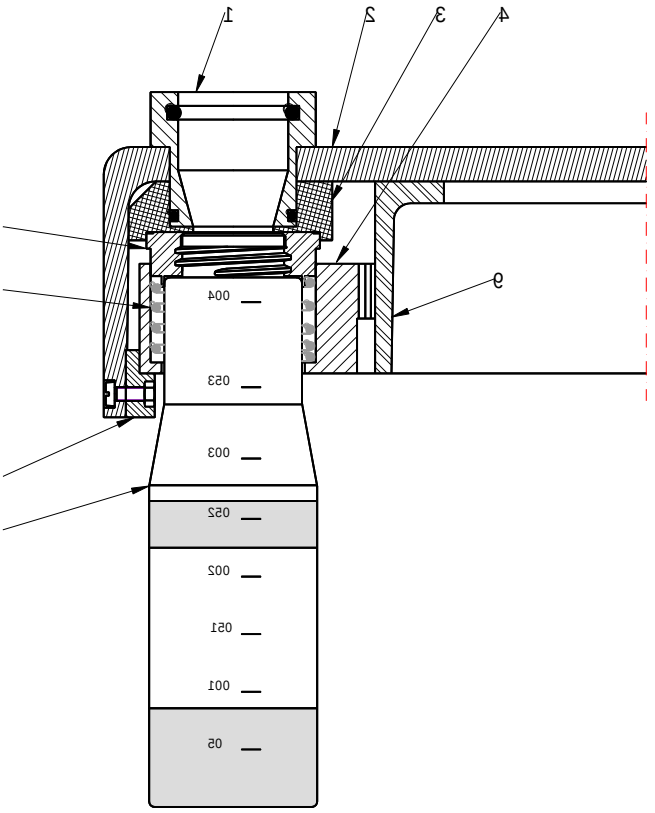


1 battery cover
2 fastening for control unit
3 control unit
4 drive unit
5 connecting cable to the control unit
6 connection for serial port
7 bottom for control unit
8 locking bolt for filler opening
9 turntable
10 sample bottles
11 connection the the HALL-sensor
12 external power

Figure 2: Structure of a sample changer

The turntable is composed of the upper mounting plate (Fig. 2.2) with slide ring (Fig. 3.3) as well as the ring gear (Fig. 3.4). The mounting plate is made from seawater-resistant corrosion-free FRP material and the slide ring as well as the ring gear (Fig. 3.4) of P.V.C. The turntable diameters of the small and large Sediment Traps are 385 mm and 520 mm respectively. The height of the turntable without sample bottles is approx. 100 mm, with inserted bottles approx. 245 mm. Sediment Trap K/MT 320 has max. 41 sample bottles (the small one max. 21 or14).

The bottle holders (Fig. 3.8) are pressed against the slide ring by means of a pressure spring (Fig. 3.7) so that the bottle openings are covered and closed by the slide ring before and after the sampling.



1 hopper location
2 upper mounting plate
3 slide ring
4 ring gear
5 sample bottle
6 slide piece
7 pressure spring
8 bottle fastening
9 internal rim

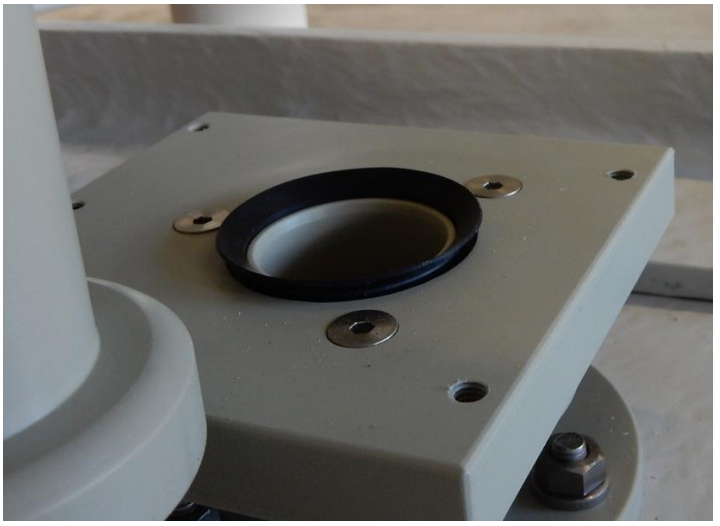
Figure 3: Sectional view of the sample changer

The ring gear is forwarded via a pinion from the drive unit by one sample opening each time. Once all lower bottles are filled through the coupling between the rings, the upper bottles start rotating. A hand-operated revolving mount (option) can be mounted onto the turntable in order to manually operate the ring gear for the equipment with sample bottles. For this purpose the drive unit is released from its support and removed. The hand-operated revolving mount is mounted in the place of the drive unit. The turntable can now be turned freely using a cam-bolt wrench or a ring-nut wrench of 13 mm width. The ring gear can also be forwarded by means of the drive unit and the connected PC (see section 4.7.3).

The sampling positions are indicated by numbers on the ring gear. They are visible from the interior side through an opening in the upper mounting plate below the hopper outlet. The sample bottles are marked on the field of the sample bottle provided for this purpose by means of a watertight pencil.

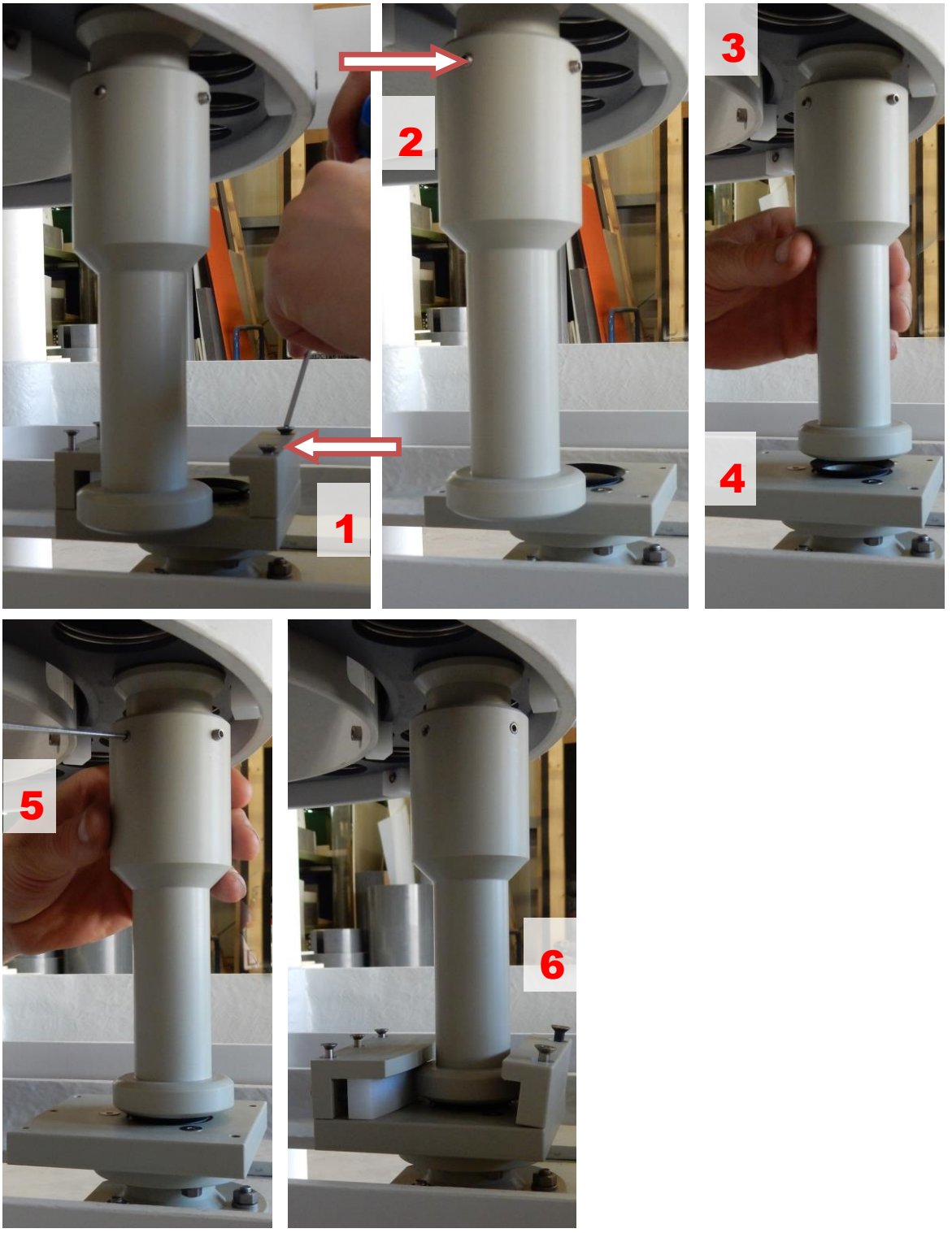
The sample bottles are inserted from below into the bottle holders of the turntable. On the top side of the turntable there is an opening in order to fill sample bottles with fixing agent.

After operation, preparing for next operation, you need to control a sealing V-Ring. Below the coupling, between the upper and lower sample changer, a V-sealing is located (see picture below).



Pictures below demonstarte how to adjust the V-sealing:

1. Remove the horizontal guards
2. Open screws of the coupling
3. Turn the sample changer until the coupling is placed directly above the sealing
4. Descend the coupling until it touches the top of the V-sealing
5. Push down the coupling another millimeter and fix it
6. Re-assemble the horizontal guards



2.4 TECHNICAL DESCRIPTION OF ELECTRONICS

The control unit of the Sediment Trap has to perform two essential tasks:

- Supervision and co-ordination of activating terms
- control of the sample change

After connecting a PC, the required times for the max. 41 samples can be loaded. These times are stored temporarily in a non-volatile RAM. The entry of the sampling times and the adjustment of the clock is performed by the PC via a serial RS 232 interface.

After programming of the Sediment Trap electronics by the PC, the connection is interrupted. Thereafter, the built-in clock takes over master function. That means, if a programmed sampling time is in conformity with the actual time, the computer system which is in sleeping mode is activated and the control programme for changing the sample proceeds. After a successive change the next time of change is transferred from the RAM into the alarm register of the clock and the system returns to the energy saving stand-by mode.

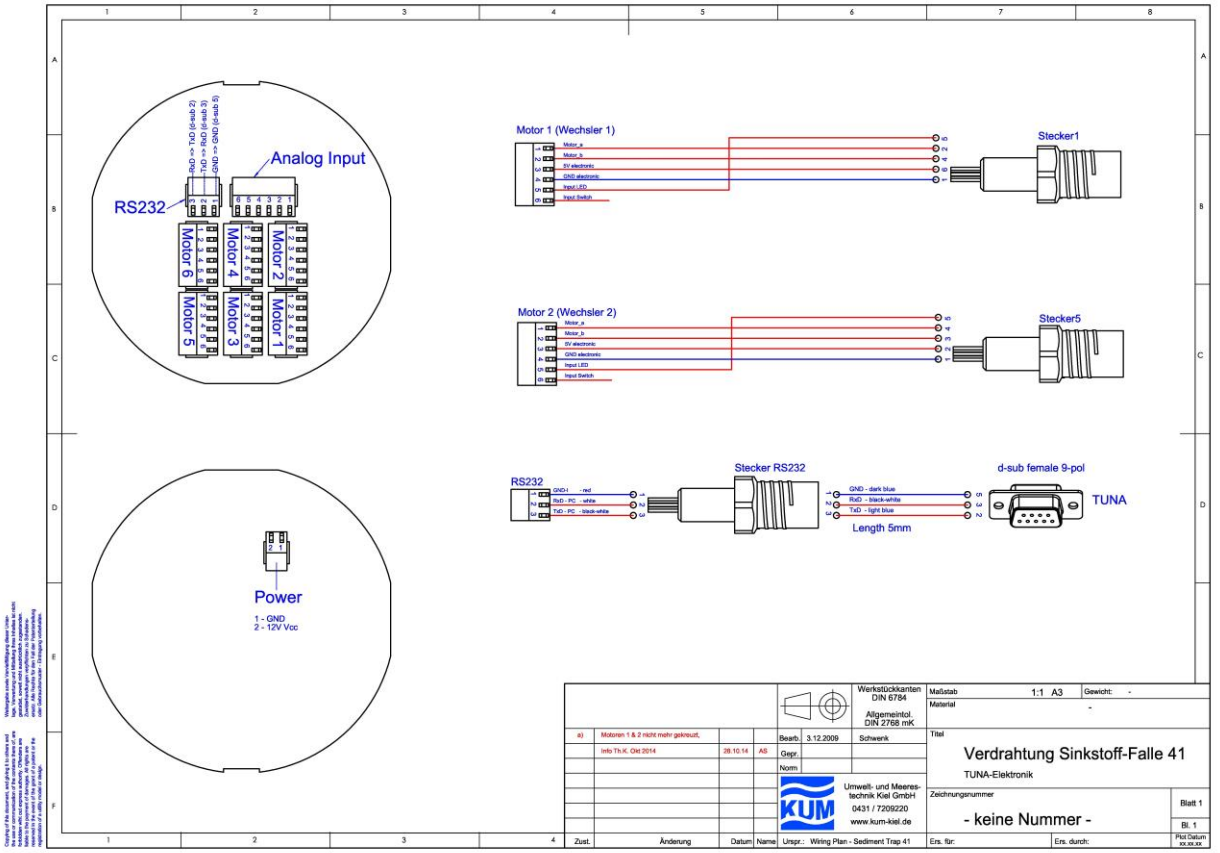


Figure 4: Block diagram of Sediment Trap electronics K/MT 320. Depending on the model some units are optional (second drive engine).

3. ESTABLISHING THE OPERATING CONDITION

3.1 ELECTRIC CONNECTION

The Sediment Trap is connected by means of max. four connecting cables, max three cables for K/MT 234 and 236. The control unit is connected to the personal computer via a serial interface cable in order to programme the sampling times. The drive unit is connected to the control unit by a pressure-watertight cable. In addition, the control unit can be served by external power.

3.1.1 Connecting the Personal Computer

A Sub-D-9 cable connects the PC with the control unit. This cable only serves for programming the sampling times and is removed after the programming. The plug connection on the control unit, having become vacant, is provided with a safety plug.

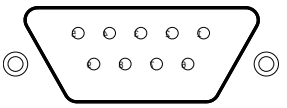


Fig 7: Plug connection to the personal computer (view of the contacts)

The connecting cable is provided with a 9-pole D female connection on the PC side and with a 6-pole underwater socket on the control unit side.

NOTE: The cable for connecting the PC is **not** included in the scope of delivery of the Sediment Trap and can only be obtained as an accessory (section 5.3.2).

6-pol. UW-connector control unit	9-pol. Sub-D-connector PC
1	5
2	-
3	-
4	-
5	2
6	3

Fig. 8: Assignment of the cable to the PC

3.1.2 Connecting the Drive Unit

The connecting cable is connected to the drive unit by means of a plug connection and **fastened** with four cheese-head screws. The connecting cable should not be disconnected.

The cable is provided with a 6-pole underwater socket on the control unit side and secured by a cap nut. **Model K/MT 320 the drive unit 1 (upper turntable) is signed using a red cap nut, drive unit 2 (lower turntable) is signed using a black cap nut .**

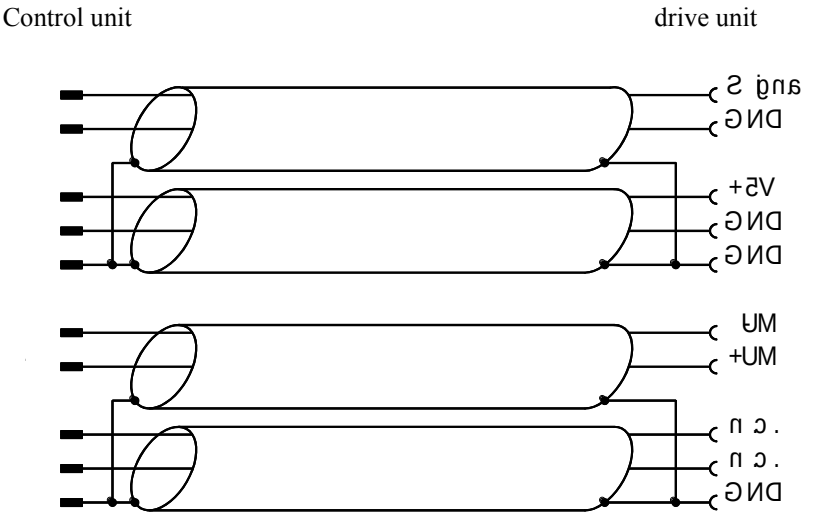


Fig. 9: Assignment of the cable to the drive unit

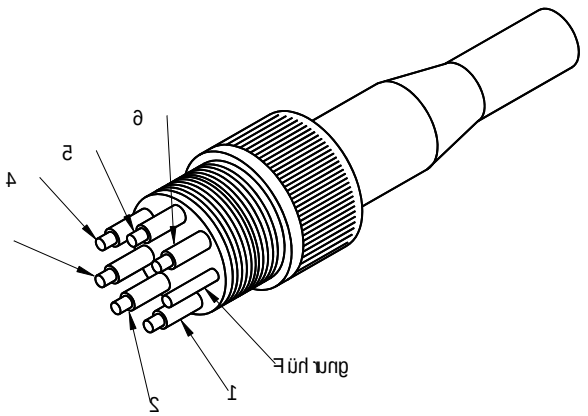
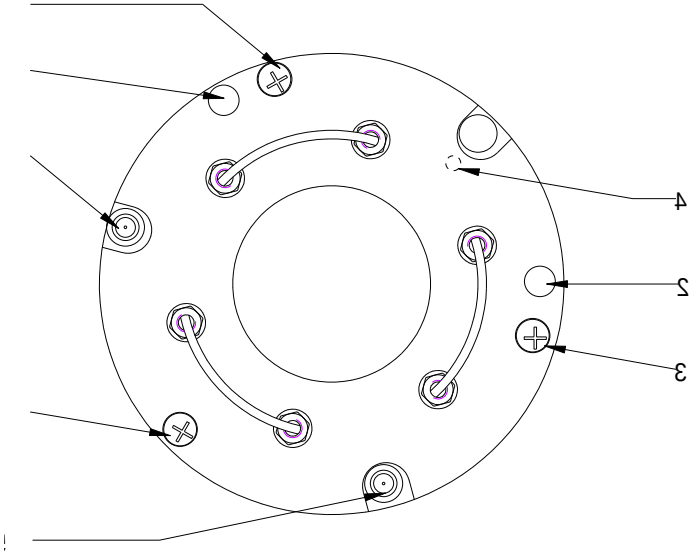


Fig. 10: Plug connection on the control unit

3.2 GENERAL MOUNTING

3.2.1 Changing the Battery

BEWARE: The battery must be changed prior to each long-term mooring.



1 plug connector positive pole
2 centre bores
3 cross-slotted screws
4 code pin
5 plug connector negative pole

Fig. 11: Bottom view of battery support

BEWARE: To unscrew or tighten the screws, only use perfect, corrosion-free tools of bronze or special steel 1.4539 or titanium TiAl6V4.

To remove the pressure pipe cover (piece with handle) of the control unit, the three hexagon screws M6 on the cover brim must be removed and screwed into the adjacent tap hole. Tighten the three hexagon screws uniformly by turning them. In this way, the cover is lifted out of its guide and can be removed completely by means of the handle. Please ensure that the cover is not canted during this procedure.

Pull the battery holder out of the pressure pipe by means of the handle. On the bottom side of the battery holder, three cross-slotted screws (Fig.11.3) are now visible; these must be unscrewed. Take off the cover of the battery box and remove the batteries.

Please ensure that the battery contacts are clean prior to inserting the new batteries. If necessary, a contact cleaning agent (e.g. Kontakt 60) can be used to remove possible oxidation deposits.

Insert the new batteries into the battery holder. Depending on the model, twelve or six mono cells of type Alkaline LR20/AM1 must be used. Only brand name batteries (e.g. DURACELL /

PROCELL) may be used. The use of mixed equipment (manufacturers or qualities) is prohibited. For long-term mooring, please observe the manufacturing date or the date of maturity.

When inserting the batteries, please pay attention to their polarity. The positive pole (battery cap) as well as the negative pole (battery bottom) of each battery must be in conformity with the symbols on the battery holder.

BEWARE: Please ensure the correct polarity of the inserted batteries in all cases. Faulty installation could lead to damage in the electronics.

Put the cover of the battery holder onto the casing and fasten it with screws. The cover is secured against twisting by means of a code pin (Fig. 11.4) on the casing. Perfect mounting must be ensured.

Insert the battery holder into the pressure pipe and revolve it until the two spigots slide into the centre bores (Fig. 11.2) of the pressure-pipe bottom. Subsequently, press the battery holder slightly downwards until it engages perceptibly.

NOTE: During insertion, please ensure that the spigots do not accidentally enter into the heads of the cross-slotted screws (Fig. 11.3).

Put the new **desiccant bags** (e.g. Minipax 1/6TME) into the battery box!

Slightly smear the O-rings in the grooves and the brim of the cover with silicone paste P.

Put the cover of the control unit onto the pressure pipe, slightly smear the three hexagon screws with silicone paste P and fasten the cover with screws. Tighten the hexagon screws uniformly by turning them.

NOTE: Do not throw the empty batteries into the waste bin, but dispose of them in the special places set aside for special waste.

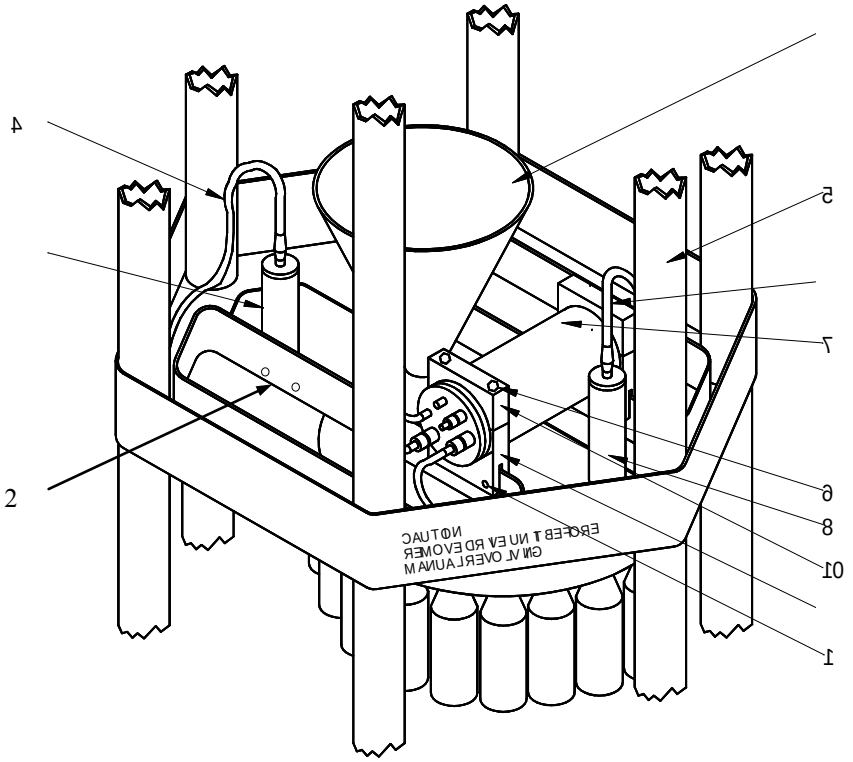
3.2.2 Mounting the Control Unit

The Sediment Trap can be launched by means of three-point (crowfoot) or one-sided fastening. Depending on the kind of launching, the control unit (Fig. 12.7) is fastened onto the intermediate bottom for trimming. In case of crowfoot suspension, the control unit is fastened opposite the drive unit (Fig. 12.8); in case of one-sided suspension, on the drive-unit side. Due to this manner of fastening, trimming by means of buoyancy bodies is not necessary.

BEWARE: To unscrew or tighten the screws, only use perfect, corrosion-free tools of bronze or special steel 1.4539 or titanium TiAl6V4.

First, two bearing blocks (Fig. 12.10) are fastened onto the intermediate bottom by two screws each. Should the Sediment Trap with one-sided suspension be moored to the fastening spar (Fig. 12.5), the screw holes (Fig. 12.1) are used to fasten the bearing blocks. If the launching is performed in crowfoot procedure (three-point fastening), the screw holes (Fig. 12.2) are used. Only the screws delivered, consisting of corrosion-resistant material, may be used for fastening.

Put the control unit into the bearing blocks and fasten it with the clamp (Fig. 12.9) and the hexagon screws (Fig. 12.6).



1 fastening holes for control unit with one-sided suspension

2 fastening holes for control unit with crowfoot suspension

3 hopper

4 connecting cable between control unit and drive unit

5 fastening spar for one-sided suspension

6 hexagon screws

7 control unit

8 drive unit

9 fastening clamp for the control unit

10 bearing blocks for the control unit

Fig. 12: Mounting the control unit

3.2.3 Mounting the Hand-Operated Revolving Mount

The hand-operated revolving mount has been designed in order to be able to manually move the turntable easily and without problem, This is a simple revolving drive and is mounted instead of the drive unit. The drive unit has to be dismounted in this case.

The hand-operated revolving mount is inserted into the pinion and fastened by two screws. Now the turntable can be moved by means of a cam-bolt wrench or a ring-nut wrench of 13 mm width.

3.2.4 Mounting the Drive Unit

In order to be able to mount the drive unit, the ring gear has first to be positioned manually in such a manner that the intake opening of the sample bottles aligns with the hopper opening. "1" has to appear in the ring gear window (Fig. 14.3).

BEWARE: To unscrew or tighten the screws, only use perfect, corrosion-free tools of bronze or special steel 1.4539 or titanium TiAl6V4.

Grease the cam slightly with silicone paste P and insert it into the drive opening with the ring gear facing down. Mount the drive unit onto the cam and fasten it by two screws (Fig. 14.3).

BEWARE: When fastening, only use the delivered, corrosion-free screws.

Connect the drive unit to the control unit (see section 3.1.2).

3.2.5 Inserting the Sample Bottles

The sample bottles have a volume of 400 ml (approx. 14 oz.).

BEWARE: In order to facilitate the launching and pick-up of the Sediment Trap, it is not advisable to mount a sample bottle below the hopper.

If the first sampling position is left vacant, the hopper is filled more easily with water during the launching procedure and it is emptied during the pick-up through the opening, without having to tilt the Sediment Trap.

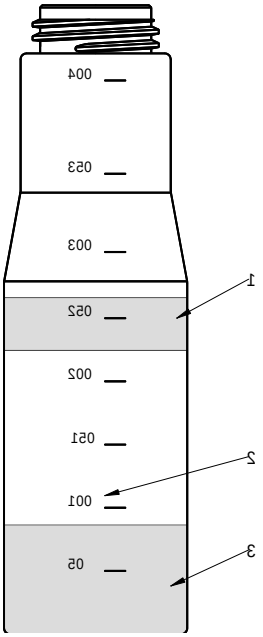
The installation of the sample bottles is performed as follows:

Designate the sample bottles on the designation field (Fig. 13.1) and mark them unequivocally. For this purpose use, for instance, a suitable water-proof felt-tip pen.

Unscrew the covers of the sample bottles, collect them and store them carefully.

BEWARE: Fill the sample bottles with liquid (water) in order to avoid deformation due to water pressure!

One after the other, screw the sample bottles (not too tightly) from below into the turntable and check that they are fit securely. If the sample bottles are fit too tightly, leakage may result. The sampling positions are indicated by numbers on the ring gear. These are visible from inside through an opening (Fig. 14, 3) in the upper mounting plate below the hopper outlet. To ease the process, the turntable can be forwarded by the motor unit one position at a time (see section 4.10.4). The turntable can be revolved manually or by the hand-operated revolving mount; for this purpose, however, the drive unit has to be dismounted.

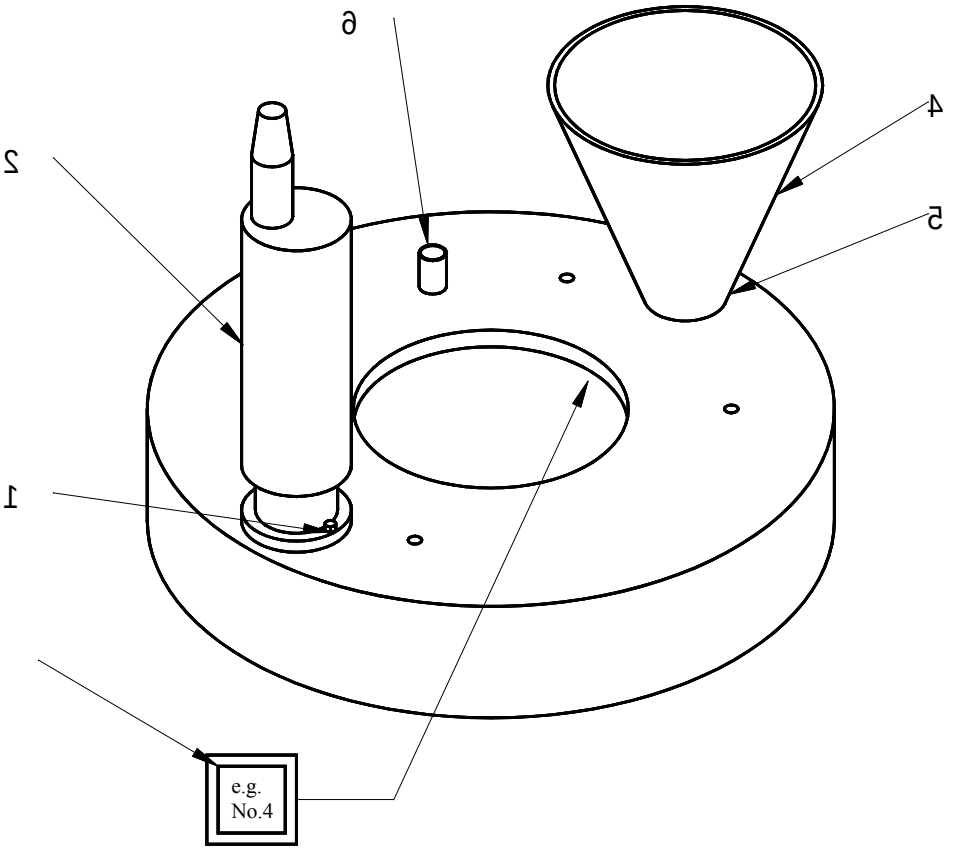


1 designation field
2 scale for filling capacity
3 handling piece

Fig. 13: Sample bottle

NOTE: At all events it must be ensured that the batteries are replaced by new ones after revolving with the motor unit and prior to employment!

After removing the locking screw (Fig. 14.6) you will find an opening on top of the sample changer for the complete and airless filling of the sample bottle. This opening also serves for filling with any fixing solution. Due to this, treating the sample bottle filled with fixing solution is not necessary prior to mounting. For filling, the turntable has to be revolved to such an extent that the respective bottle is located below the filling opening.



1 screws for drive unit
2 drive unit
3 sample No. indicator
4 hopper
5 filler tube
6 locking screw

Fig. 14: View of sample changer

3.2.6 Dismounting the Sample Bottles

Manually unscrew the sample bottles from the turntable and remove them carefully in a downward direction.

Close the sample bottles with the screw caps provided for this purpose.

Further measures are not required. The sample changer is ready for the next measuring cycle after cleaning, programming and changing the battery, if required.

Additional sample bottles can be obtained as accessories (see section 5.3.2).

4. OPERATION AND PROGRAMMING

4.1 GENERAL

We recommend that you keep a launching protocol for each sediment trap along with a logbook containing the data of the launching , the pick-up and maintenance work.

This log must also document the inspection, which should be performed by the manufacturer every five years.

The included software TUNA enables you to print out configuration, mooring and pick-up protocols .

4.2 IMPORTANT INSTRUCTIONS FOR HANDLING THE PROGRAMME SEDSHED

The software enables you to create a logfile prior to launching and a further logfile after pick-up that can be referred to for trouble-shooting in case of malfunctions.

How to print out the contents of these logfiles having the extension .You will find a detailed description in the TUNA-manual.

Caution: When shipping the sediment-trap to the manufacturer because of a malfunction, all of the files generated during the programming and after pick-up must be copied onto a diskette and must be included in the shipment. Only then the cause of the trouble can be sufficiently judged, especially in case of warranty demands.

4.3 GENERAL OPERATING SEQUENCE

4.3.1 Procedure for Launching the Sediment Trap

This section includes a short instruction (check list) of the general procedure up to launching the Sediment Trap. The numbers stated in the third column refer to the section giving a detailed description of the process.

The programming dialogue guides you semi-automatically up to the instruction to disconnect the PC. It also eliminates the necessity for you to perform separate tests as these are executed by the system automatically and irregularities are indicated as messages on the PC.

Caution: Error messages displayed in a separate window must be taken seriously on all accounts and their reason must be examined. The programming process must be repeated after correcting the error.

The following processes must be performed in the sequence given below before launching the Sediment Trap:

Process	Section
1. Marking and mounting the sampling bottles	3.2.5
2. Changing the batteries	3.2.1
3. Mounting and connecting the control unit and the drive unit	3.2.2, 3.2.4
4. Connecting the PC to the control unit	3.1.1
5. Installing the TUNA software (only for first employment of the PC)	4.5
6. Starting the TUNA software program	see attachment
7. Entering the name of the Sediment Trap	see attachment
8. Setting up the configuration and programming of the sampling data	see attachment
9. Transmitting the sampling data to the electronics	see attachment
10. Disconnecting the PC electrically and sealing the open socket by means of the safety plug provided	-
11. Exiting the program	see attachment
12. Launching the Sediment Trap	-

4.3.2 Procedure for Picking up the Sediment Trap

This section includes a short instruction (check list) of the general procedure to pick up the Sediment Trap. The numbers stated in the third column refer to the section giving a detailed description of the process. The sequence of the programming session is entirely automatic and ends with the instruction to disconnect the PC.

For picking up the Sediment Trap the following processes must be performed in the sequence given below:

	Process	Section
1.	Picking up the Sediment Trap and rough cleaning by rinsing with fresh water	-
2.	Connecting the PC to the control unit	3.1.1
3.	Starting the TUNA software program	see attachment
4.	Saving the data stored in the Sediment Trap	see attachment
5.	Disconnecting the PC electrically and sealing the open socket by means of the safety plug provided	-
6.	Exiting the program	see attachment
7.	Removing the sampling bottles	3.2.6
8.	Final care and maintenance	5.2

4.4 GENERAL PROGRAMME DESCRIPTION

The program TUNA was developed by the company K.U.M. Umwelt- und Meerestechnik Kiel GmbH in order to program the Sediment Trap and to save and print out the acquired data.

The graphic interface protects the user as far as possible against operational errors. The menu lists programming functions that can be initiated by the user either by mouse click, tab key or key combinations specific to Windows.

The software can be run on IBM-compatible PCs under operating systems Windows 2000 to Windows 7. The software is named

TUNA.EXE.

While running, the software will create further files. Among other things these files serve to save data once set, or respectively to store measured data after picking up the Sediment Trap in order to evaluate and print them later on. Furthermore, log files are created, which can be used for trouble-shooting in case of irregularities.

Transfer of different windows to the printer is in ASCII- format. This makes printout on almost any printer possible. The printer connects to the parallel port (Centronics). Directions for connecting and configuring the printer must be taken from the manual of the printer.

4.5 PREPARATIONS

4.5.1 System Configuration

To execute the program TUNA the minimum recommended system requirements are:

PC or Laptop with
- RS 232 serial port or
- USB-to-RS232 converter (we **strongly** recommand Prolific 2303)
- Windows NT/2000 to 7

4.5.2 Creating Back-up Copies of the TUNA-Files

* removed since rev. 2009 *

4.5.3 Installing the Software on the Hard Disk

Become admin and start the setup routine “TUNA Setup.exe”. Follow the instructions of the software.

4.5.4 Starting the Program

* removed since rev. 2009 *

4.5.6 Exiting the program

* removed since rev. 2009 *

4.6 CONFIGURATION AND PROGRAMMING

As with the development of new electronics and software “TUNA” you will find the software description in a separate manual. You will find this manual attached.

5. MAINTENANCE AND CARE

5.1 INSPECTION

* removed since rev. 2009 *

5.2 MAINTENANCE AND CARE

The Sediment Trap has to be rinsed thoroughly after each employment with sweet water and if necessary it must be completely freed from mussels and fouling. The plug connectors of the drive unit as well as the pinion of the sample changer must be cleaned from seawater remainders and smeared slightly with silicone paste P.

Care of the components is restricted to the cleaning of the casing surfaces and check for outer damage. When cleaning it is advisable to remove the dirt by means of a brush and a wetted cloth. Generally, the use of soft soap suds will be sufficient.

BEWARE: Do not use strong cleaning agents or solvents (gasoline).

5.2.1 Putting out of Operation

In order to put the Sediment Trap out of operation for a longer period, the following measures must be performed:

- Remove the batteries from the battery holders (see section 3.2.1) to avoid leakage.
- Protect the plug connectors on the control unit and the drive unit against dust and humidity. If the units are stored separately, provide them with protective caps or connect the cables correctly.

When putting it into operation again, new batteries must be inserted (see section 3.2.1).

5.2.2 Transport and Storage

The Sediment Trap must be transported and stored appropriately. It must be protected against detrimental influences and heavy vibrations such as shock, impact, etc.

During storage the batteries must be removed (danger of leakage) (see section 3.2.1).

The storage temperature should remain within the admissible temperature range of -30 °C to +70 °C.

5.2.3 Exchanging the O-Rings in the Drive Unit

The O-Rings should be changed after each deployments. The Slide pieces need to be changed if they are damaged.

Remove the drive unit from the turntable. In order to do this, the two hexagon screws (Fig. 14.1) must be removed.

Unscrew the two plastic screws (Fig. 27.1) on the front panel of the drive unit and remove the washer (Fig. 27.2).

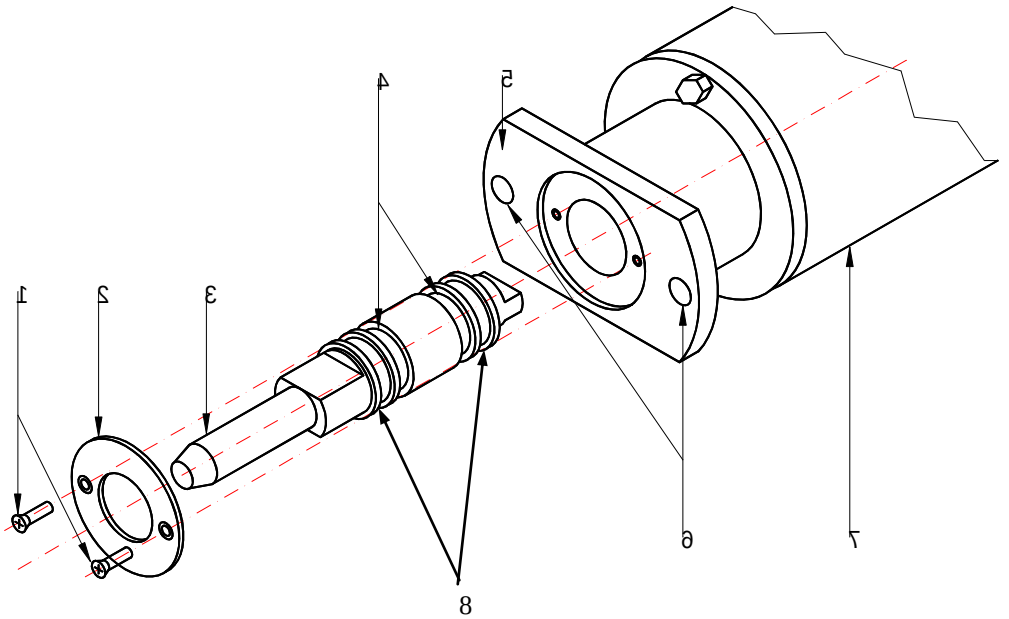
The shaft (Fig. 27.3) can now be drawn out of the drive unit. Revolve the shaft slightly to and fro whilst doing this.

Remove the two O-rings (Fig. 27.4) from the shaft.

Smear the new O-rings slightly with silicone paste P and insert them. Only new original O-rings laminated with PTFE (see accessories section 5.3.2) should be used to guarantee the imperviousness of the drive unit.

The reassembly of the drive unit is performed in the reverse order.

NOTE: Only plastic screws (Fig. 27.1) must be used to fasten the washer (Fig. 27.2).



1 countersunk screw M3x8
2 washer
3 Shaft
4 O-rings
5 flange
6 fasting for drive unit on sample changer
7 drive unit
8 slide pieces

Figure 27: Exchanging the O-ring of the drive unit

5.2.4 Disassembling and Cleaning the Sample Changer

In order to maintain the sample changer in case of contamination or in case of failure, it can be disassembled and reassembled after cleaning as follows.

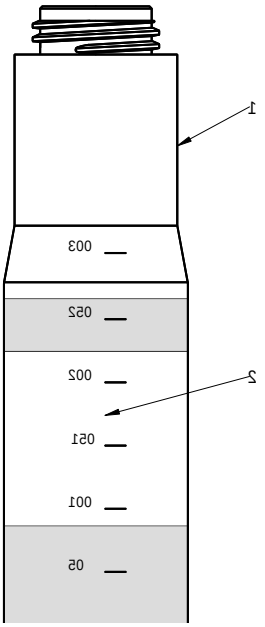
BEWARE: Only use perfect, corrosion-free tools of bronze or special steel 1.4539 to unscrew and tighten the screws.

Dismount the control unit and the drive unit.

In order to dismount the sample changer, unscrew the four hexagon screws from the central intermediate bottom using a 13 mm wrench. In order to do this, hold the sample changer from below with the aid of a second person or support it if necessary. The sample changer has a weight of approx. 14 kg.

Put the sample changer onto a strong base plate with the openings of the sample bottles showing upwards.

Slip the mounting aid (Fig. 28.1) onto all sample bottles and screw all sample bottles into the sample changer by hand. The pressure springs are fixed and thus relieve the turntable.



1 Montagehilfe
2 sample bottle

Figure 28: Sample bottle with mounting aid

Remove the internal ring gear (Fig 3.9) together with the six slide pieces from the sample changer. In order to do this, the two hexagon screws fixing the internal ring gear to the sample changer are unscrewed by means of a 13 mm wrench.

Dismount the six slide pieces (Fig. 3.6) by removing the screws. The ring gear (Fig. 3.4) can now be removed from the mounting plate.

Turn over the mounting plate and remove the three screws, that are screwed in from the top to fasten the slide ring. Remove the slide ring.

In order to be able to disassemble the ring gear, the sample bottles must be unscrewed. You must proceed carefully, because the pressure spring releases the tension. Hold the bottle holder by hand in order to avoid distortion.

All components should only be cleaned using soft soap suds and can be disinfected with a disinfectant when necessary.

BEWARE: Do not use strong cleaning agents or solvents (gasoline). Do not treat or scratch sliding surfaces and ring gear by sharp objects such as e.g., a screw driver.

The reassembly is performed in reverse order.

5.2.5. Calibration of the turntable

STEP 1: After cleaning and assembling the turntables are mounting in the frame. First the upper has to be mounted fixed by the four mounting screws and the end of the hopper. Second, the lower turntable is mounted, fixed by the four mounting screws and two screws made of plastic.

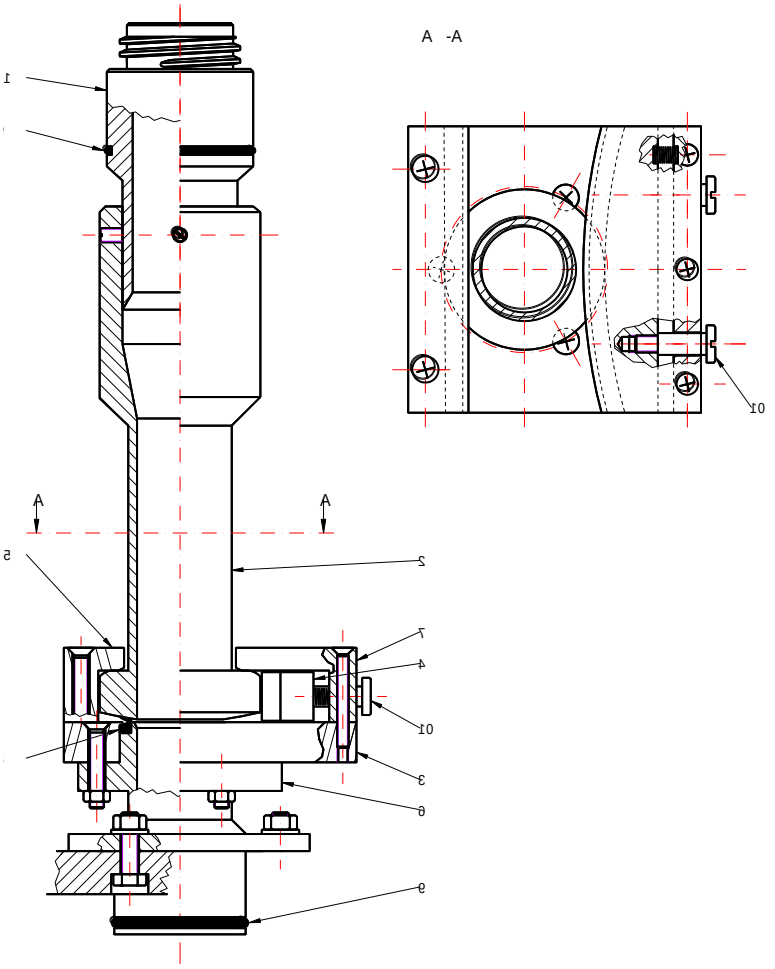
STEP 2 (only K/MT 320): Check the bottle coupling: Remove the hopper and mount both the control units and the drive units. Connect the control unit with the PC and start "TUNA". Using „Controller" – „Live Monitoring" - „Action Index: 1" let the revolve the ***lower*** unit one step, the holes should be exactly in a fitting position. In case not, remove the drive unit and mount it one step further. Repeat these steps until the holes fit perfect.

STEP 3 (only K/MT 320): Mount the coupling to the ***upper*** turntable and use again "TUNA" to revolve the upper turntable until the holes fit: Use „Controller" – „Live Monitoring" - „Action Index: 2". In case the holes don't fit, remove the drive unit and mount it a step forward. Repeat this steps until the holes fit.

STEP 4 (only K/MT 320): Check whether the upper turntable, the coupling and the lower turntable fit perfect. In case they don't, the LOWER turntable is mounting in a wrong position! You have to remove it again and mount it a little bit aside.

5.2.6. Calibration and disassembling the coupling (only K/MT 320)

The coupling connects the upper and the lower turntable and contains 10 major parts:



1	connection	6	frame
2	tube	7	connection widget
3	assembling plate	8	V-Ring
4	slide piece	9	O-Ring
5	direction determination	10	screw

Figure 29: coupling

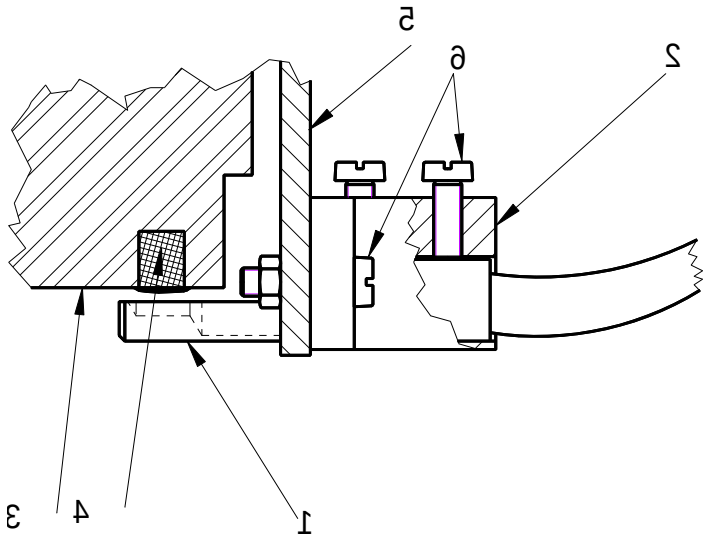
To disassemble the coupling the tube has to be revolved until it is totally free. Tube and connection are screwed out of the bottle neck. Now divide tube and connection. The direction determination is just fixed with three screws now, they have to be removed and the direction determination has to be removed from the lower turntable. Carefully check the V-ring and change it if its damaged. To change the V-ring, remove the mounting piece using the two screws from plastic and than the three screws from the plate which has to be removed also. Smear the new V-ring slightly with silicone paste P and insert it. The reassembly is performed in reverse order. Check whether the slide piece is easy to move and clean it if necessary.

After cleaning and control the complete item has to be mounted to the lower turntable again. Tube and bottleneck are screwed into the upper turntable. Slowly revolve the tube to the direction determination, the tube can be slightly moved in height using four screws. Fitting point is the upper part of the tube together with the lower part of the direction determination. Slowly revolve the tube one more step, it must not tilt neither the V-ring must not be pushed away.

5.2.7. Assembling and Calibration of the Position-sensors

The Sediment Trap can be supplied with an additional check of revolving: the Hall-Sensors (Fig. 30). They support a second control in addition to the optical barrier inside the drive units, e.g. if a dead fish comes between drive unit and turntable, the drive unit may not succeed in revolving the turntable. In this case the control unit realises a fault and instead of wasting battery power by endless tries to revolve it terminates the drive unit. After a while the fish could be gone either by bigger fish or by plankton and the revolving could succeed. However, you have a gap in your experiment in both cases, with the position sensor you can succeed with the next samples.

To let them safely work, you have to calibrate the sensor each time after cleaning the trap. The sensor are assembled inside of the turntable (Fig. 30). To calibrate them, let revolve the turntable by schedule (roundabout 15 sec.) until the black rubber is directly below the sensor. Move the sensor until the distance to the rubber in height is roundabout 2mm and the radial distance is 3mm. After calibrating the sensor a test using a short schedule is recommended. Read the status list to check the sensors.



1 sensor
2 sensor carrier
3 turntable
4 magnet with rubber
5 inner turntable
6 screws to move the sensor

Figure 30: Positions sensor (as an option)

5.3 SCOPE OF DELIVERY AND ACCESSORIES

5.3.1. Scope of Delivery

The scope of delivery of the Sediment Trap includes:

- frame construction with intermediate bottom
- hopper
- 2 sample changer with 2x20 sample bottles
- control unit, optional with Inclinometer
- 2 drive units (K/MT 320) with cable
- Software „TUNA“
- user's manual “SEDIMENT TRAP” and “TUNA”

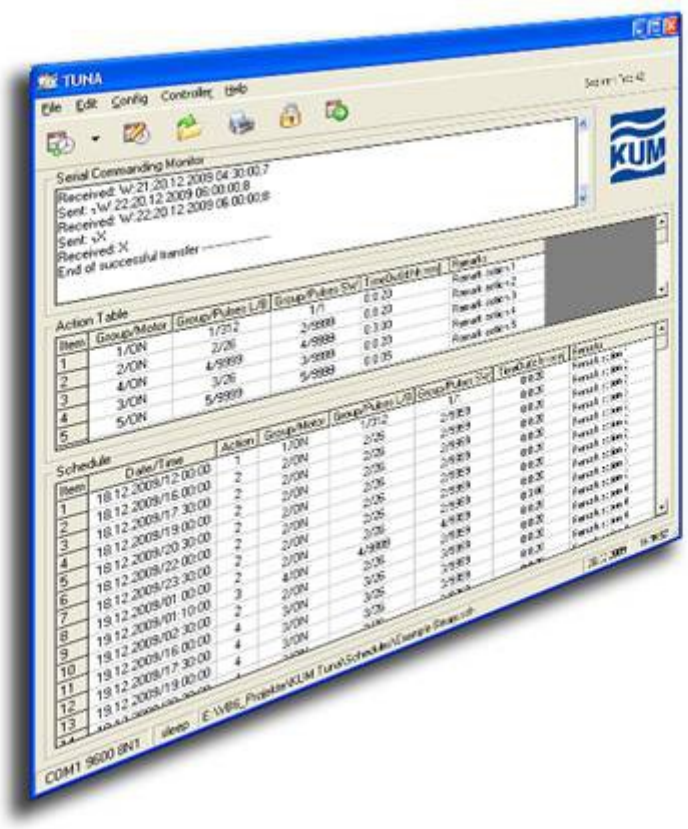
5.3.2. List of Accessories

The following accessories can be obtained via the type number from K.U.M. Umwelt- und Meerestechnik GmbH:

Designation	**Typ**
Connecting cable to the personal computer with 9- pole connecting plug and adapter USB- connection	K/MT 271-01
Maintenance set, complete - O-rings for the drive shaft - O-rings for the battery cover - silicone paste P (small quantity) - dessiccant bag	K/MT 310-01
battery set, 12 pieces alkaline mono type (6 pieces for K/MT 234 and K/MT 236)	K/MT 310-02 K/MT 236-02
Set of tools, complete.	K/MT 310-03
Electronics of the control unit in exchange, complete with cover	K/MT 310-04
Motor-gear unit, complete with light barrier	K/MT 310-05
Mounting set for sample changer with mounting aids for sample bottles	K/MT 310-06
Repair set, complete - electronics of control unit in exchange, complete with cover - motor-gear unit - service manual - maintenance set (3x) - set of screws of titanium - tools set	K/MT 310-07
Repair set, complete, for KMT/234 and KMT 236. Contents like above but only one drive unit	K/MT 236-07
protective cap for K/MT 320 and K/MT 234	K/MT 320-02
protective cap for K/MT 236	K/MT 236-02
hand-operated revolving mount	K/MT 320-03
crowfoot fastening, complete	K/MT 320-04
service manual	K/MT 320-05
sample bottle, 1 piece	K/MT 320-06

TUNA

Version 1.01



TUNA Scheduling Software

User Manual

Amendment/ Change Record

On receipt of an amendment to this document following the instructions of the amendment and make according notes in following record table.

Amendment/ Change Record		
Description of Amendment/ Change	**Inserted by**	**Date**
Adapted chm-file to printable file, changed Lander-files to Sediment Trap-Files	A.Schwenk	03.12.2009
Updated Windows 7	A.Schwenk	08.02.2013

Acronyms

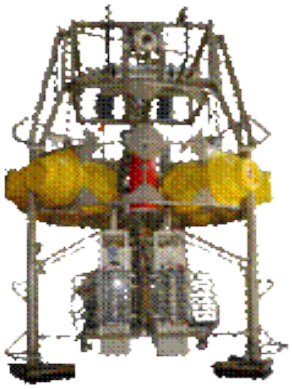
KUM K.U.M. Umwelt- und Meerestechnik Kiel GmbH

COM Serial Communication Port

1 Introduction

1.1 Application

TUNA is software which allows for the preparation of working schedules and transfer to the controller of a K.U.M. Lander and Sediment Trap.



KUM Lander

KUM Sediment Trap

1.2 Grant of License

The user of subject software is granted a non-exclusive right to apply the software on a single computer as long as he complies with following general conditions.

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1.3 System Requirements

Software platform..... Windows XP to Windows 8.1

Serial ports..... 1 out of COM1 to COM8

In case your PC is not equipped with any serial port, you may use a USB to RS232 converter. We have made good experiences with converters that are based on PROLIFIC 2303 electronics. This converter is available at KUM as well.

2 Installation

2.1 Installation of TUNA

2.1.1 Installation of Software

Insert the CD ROM, start the program SETUP.EXE from Windows and follow the instructions. The available COM-Port has to be selected at first start of TUNA (please refer to chapter ‘First Start of TUNA’).

2.2 Interfacing to PC's RS 232 Ports

2.2.1 COM Ports

TUNA can be configured for serial ports COM1 to COM8.

Important notes:

- Serial communication may not work properly if you don’t use independent Interrupt Request (IRQ) lines for both channels
- No driver shall be running on a COM port to be used (e.g. serial mouse driver)
- No other software application capturing required serial ports should run

2.2.2 TXD and RXD Lines

TUNA requires the TXD and RXD lines of the serial I/O port to be interfaced as follows:

	PC's socket pin no.	
Function	**25 pins**	**9 pins**
TX output	2	3
RX input	3	2
Ground	7	5

Hardware handshake lines are not required.

3 Operating Instructions

3.1 First Start of TUNA

If TUNA is started the first time following configuration dialogue is shown:

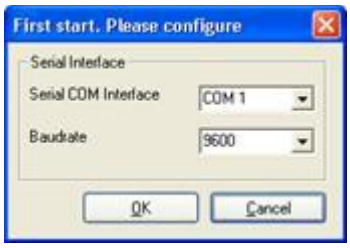


Figure 1: Main Window

Select the wanted COM-ports and click OK.

As all K.U.M. equipment is using 9,600 b/s it is not recommended to change baud rate.

After program start the selected port parameters are indicated on the main program windows:

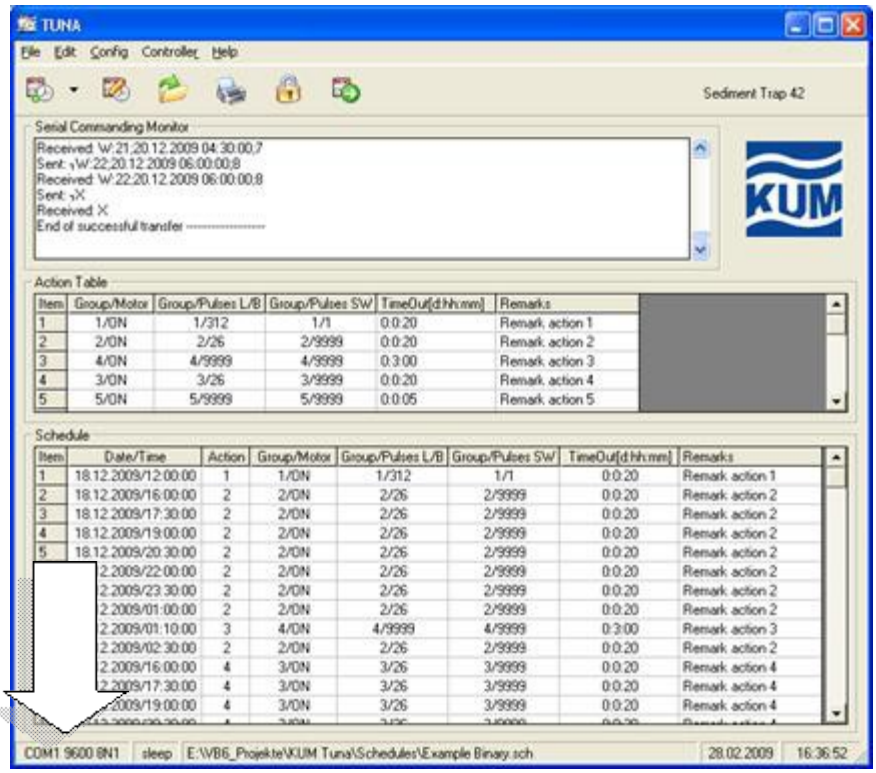


Figure 2: Indication of Serial Communications Parameters

3.2 TUNA's Main Window

The most important functions of TUNA are accessible through the TUNA tool bar and the status bar provides important status information.

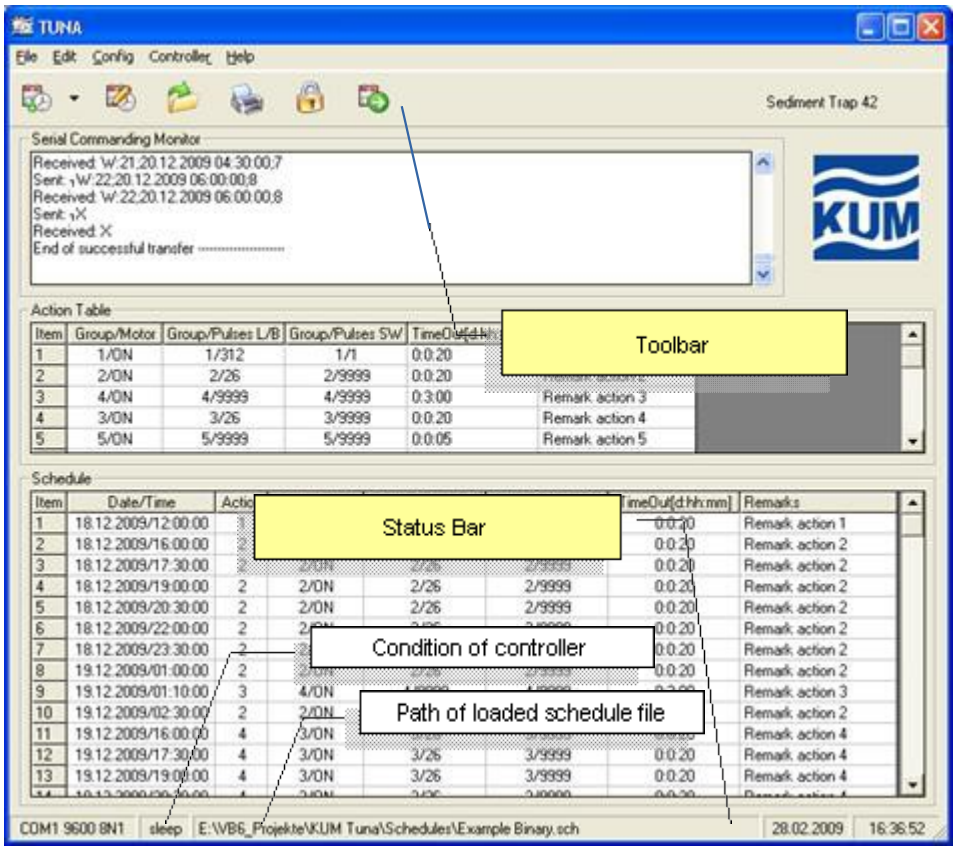
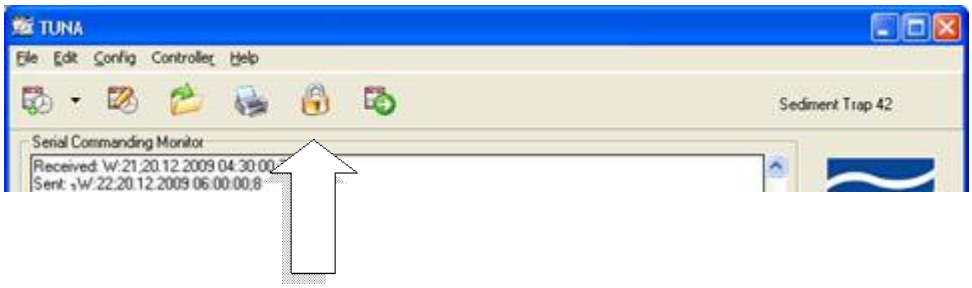


Figure 3: TUNA's Main Window

3.3 KUM Service Mode

TUNA provides special additional features not available for users. To put TUNA in the KUM service mode click on the padlock icon



IMPORTANT NOTICE: You can enter **any** values you need to handle and program the unit **without** using the service mode. This mode is for debugging purposes by KUM only!

Figure 4 and 5: KUM Service Mode

With the correct password TUNA provides three additional features:

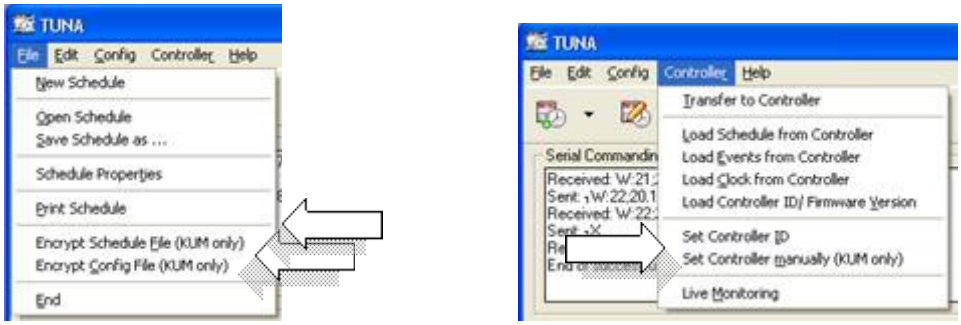


Figure 6: Special KUM Service Features

3.3.1 Manual Setting of Controller

The manual control windows offers functions provided for **testing only**.

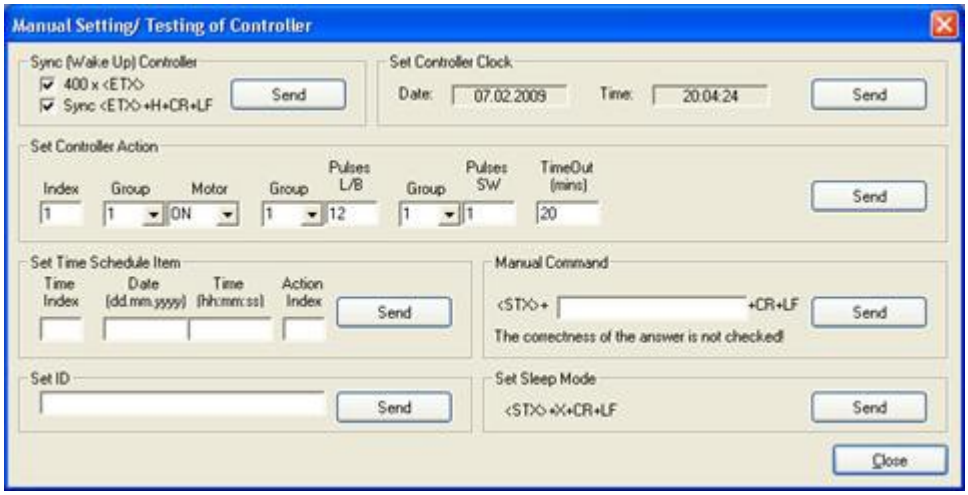
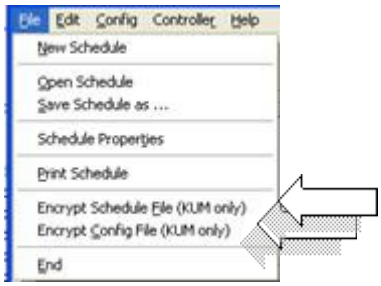


Figure 7: Manual Control Dialogue

3.3.2 Encryption of Schedule and Config Files

To save the complex electronics and the engines against accidental misuse and damage (e.g. engines that run simultaneously) the config files and schedule files are encrypted. The according menu items can be found in the Files menu after entering the KUM password which is available to KUM staff only.



The encryption dialogues are starting with the selection of the file to be encrypted.

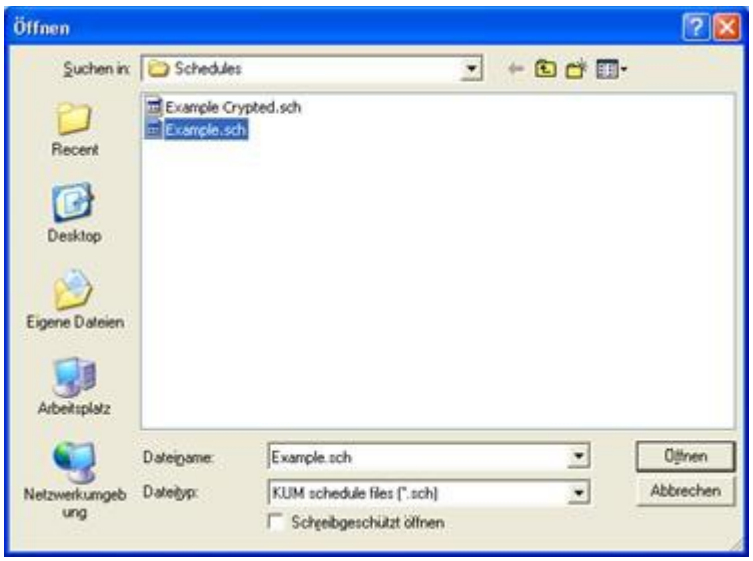


Figure 8: Open Dialogue for Encryption of a Schedule File

The next window is asking for the password to be used. TUNA provides a choice between the KUM Standard Encryption Password which is recognised automatically and doesn't require the entrance of a password

Figure 9: KUM Standard Encryption Password

and a special Password which causes TUNA to ask for a password when loading the schedule file.

Figure 10: Special Encryption Password

The encryption process ends with a standard saving dialogue.

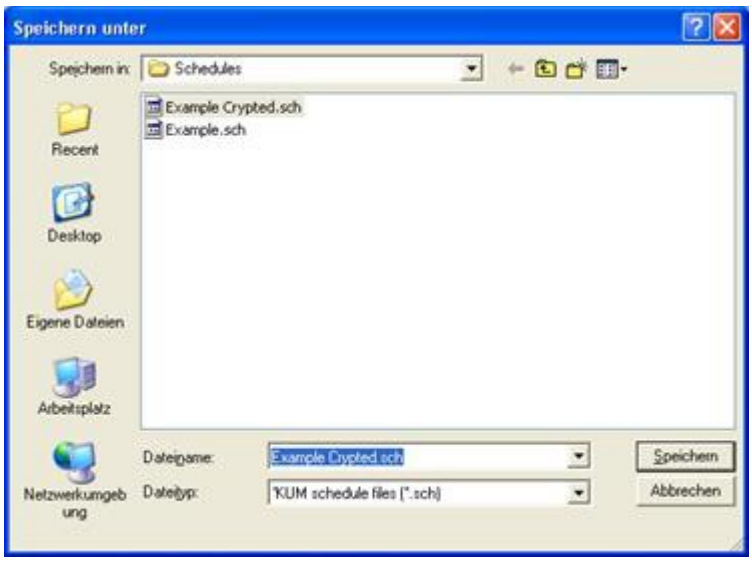


Figure 11: Saving the Encrypted File

3.4 Generating a Schedule

TUNA allows for the generation of schedules controlled by rules specified in a Config file. The Config-File ensures that all times are within range, so its forbidden to choose times that are faster than the carousel. To edit a schedule a config-file has to be loaded before. The config-file you use enables you to choose times between 10 minutes and 30 days as a delay between two bottles. In case you would need shorter or longer delays, please contact us. We will supply a new config-file adapted to your needs. Never use a config-file that does not fit to your equipment!

To start generating a schedule click on the schedule icon and either choose ‘Lander’, ‘Sediment Trap’ or ‘Load …’:

Figure 12: Selecting a Config

In case of ‘Load …’ TUNA provides a standard open dialogue:

Figure 13: Opening a Config File

The config file is loaded in the Schedule Editor window:

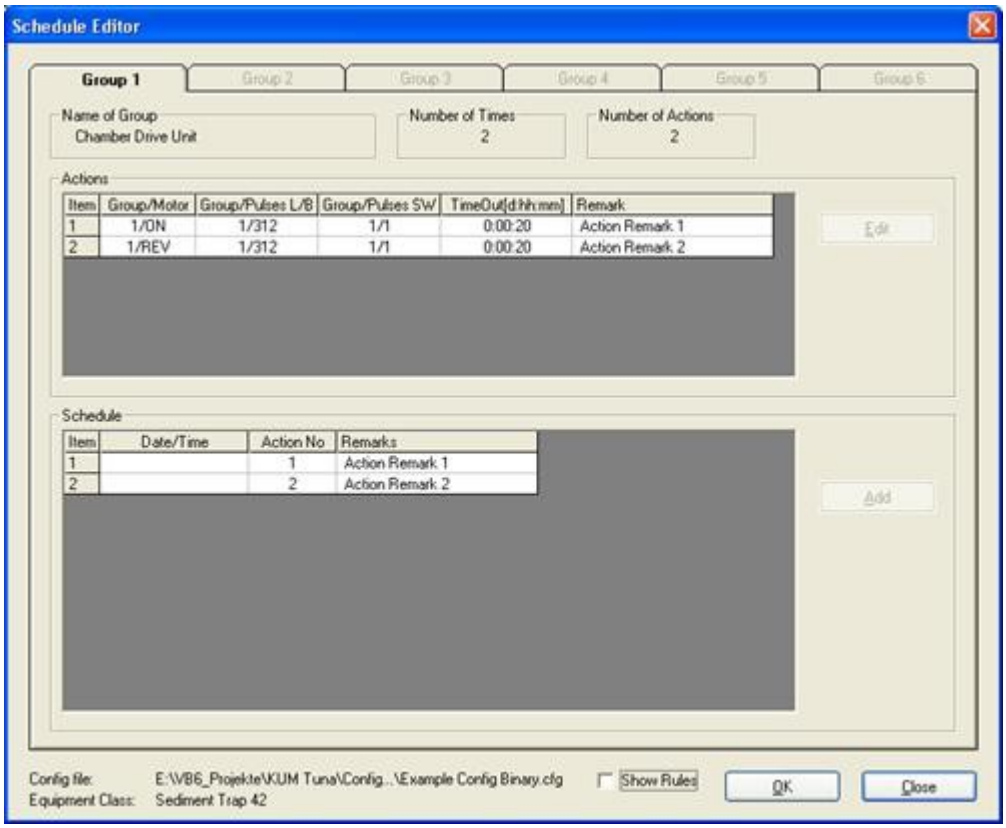


Figure 14: The Schedule Editor Window

In order to modify an action double-click on the item or mark it and click on the Edit button. The Action Edit Dialogue allows modifications only as far as allowed by the rules in the Config file.

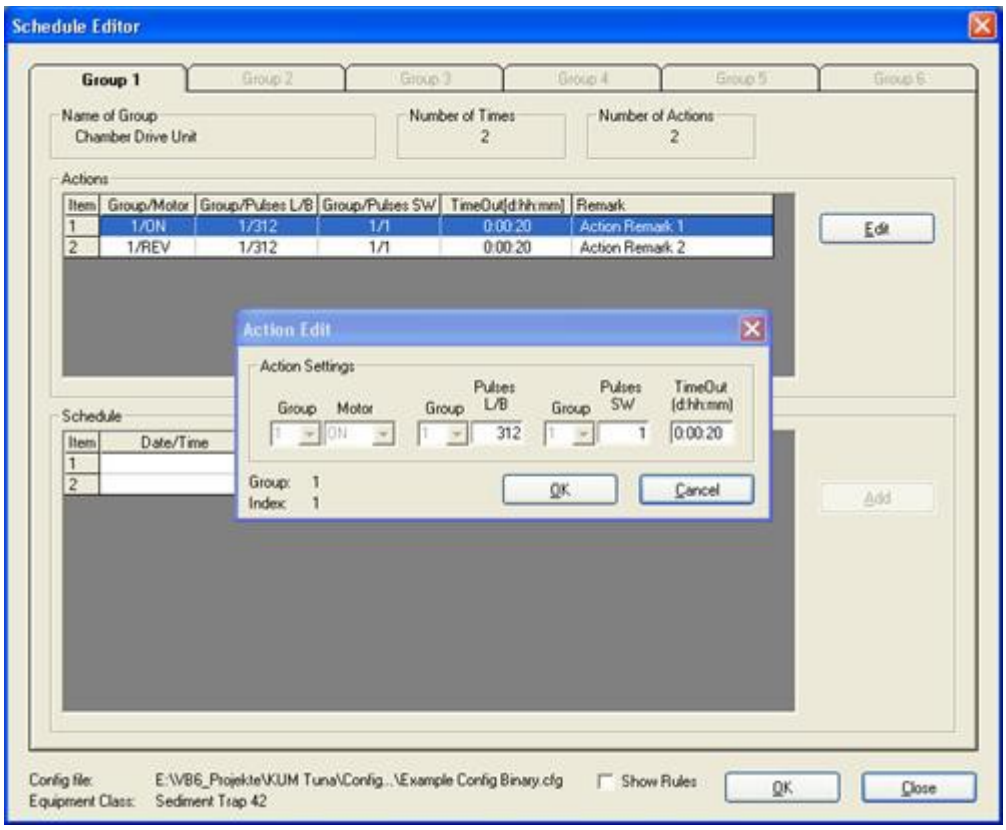


Figure 15: Action Edit Dialogue

After reaching a destination time, the electronics starts a routine that we call “Action”. Within given ranges you can control this action, e.g. by varying the time-out (after which the routine stops, no matter if the job is finished or not) or by varying the number of pulses of the light-barrier inside the engine, after which the engine shall stop.

In order to enter a schedule time double-click on the schedule item or mark it and click on ‘Add’. The rules contained in the config file determine the input method of date and time: Fig. 16 Absolute Date and Time, or Fig 17 Relative to another schedule item

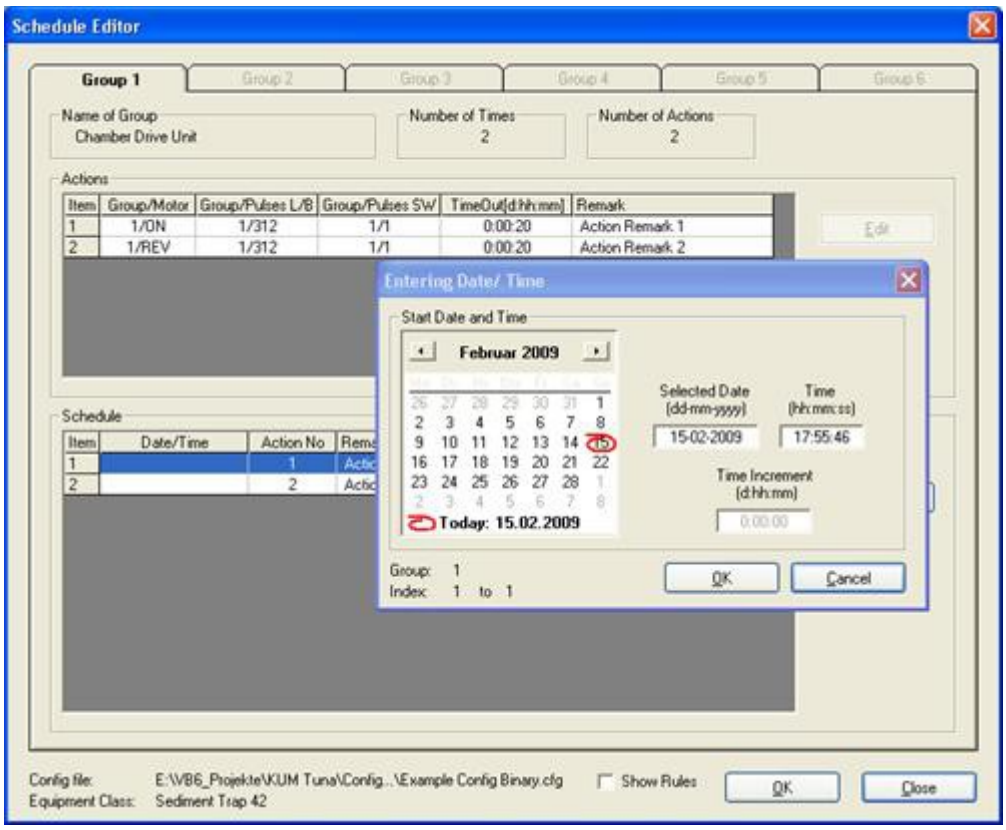


Figure 16: Entering an Absolute Date and Time

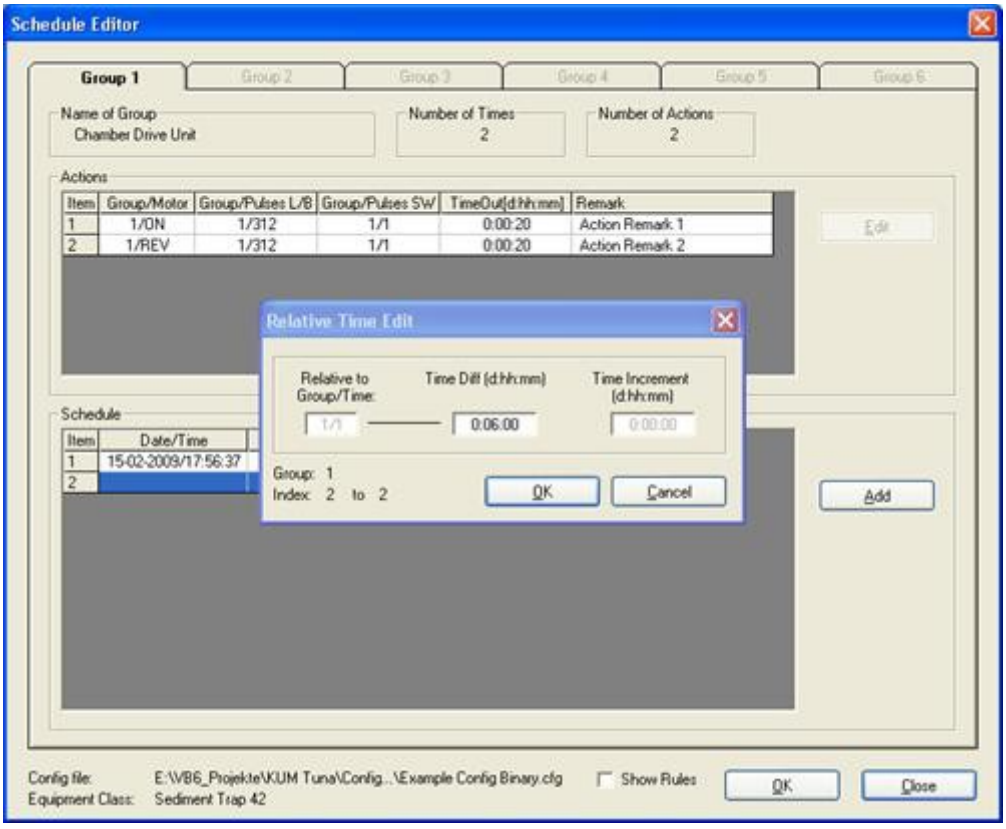


Figure 17: Entering a Relative Time

If one TAB is completed the next TAB (if exists) is enabled:

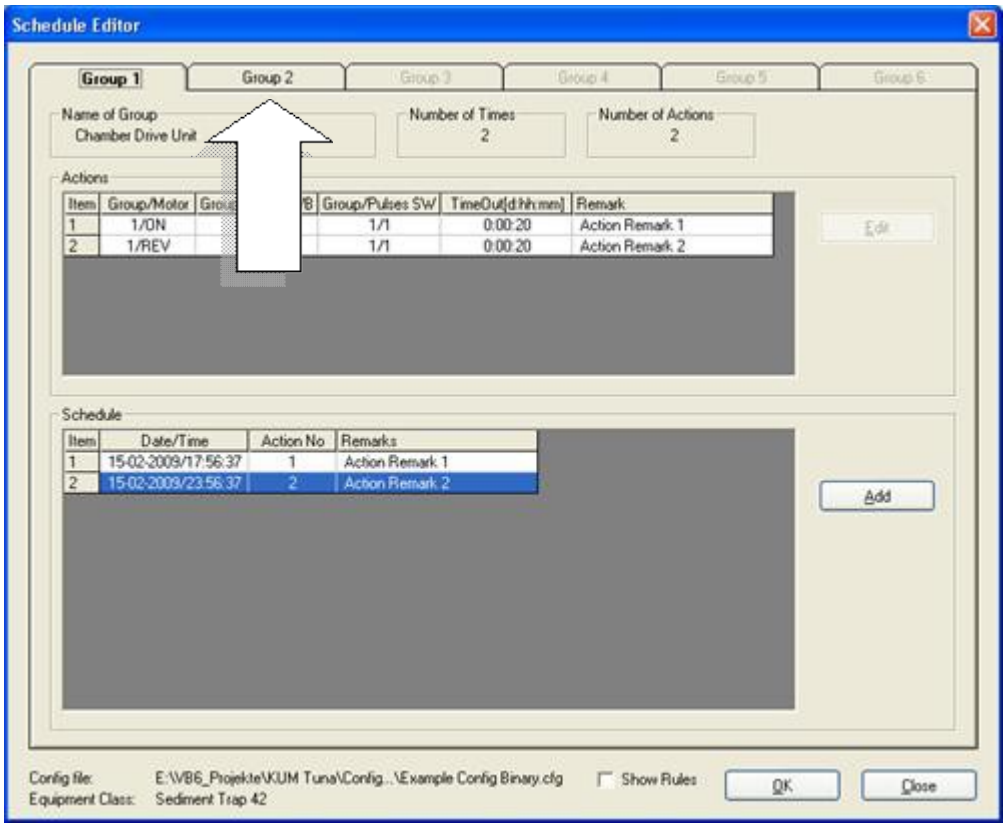


Figure 18: TAB by TAB Editing

TUNA also provides rules and means for the quick entrance of a series of times. If a selected time item belongs to such a series TUNA opens a dialogue which in addition to the relative time difference to another time item in the schedule contains a time increment parameter:

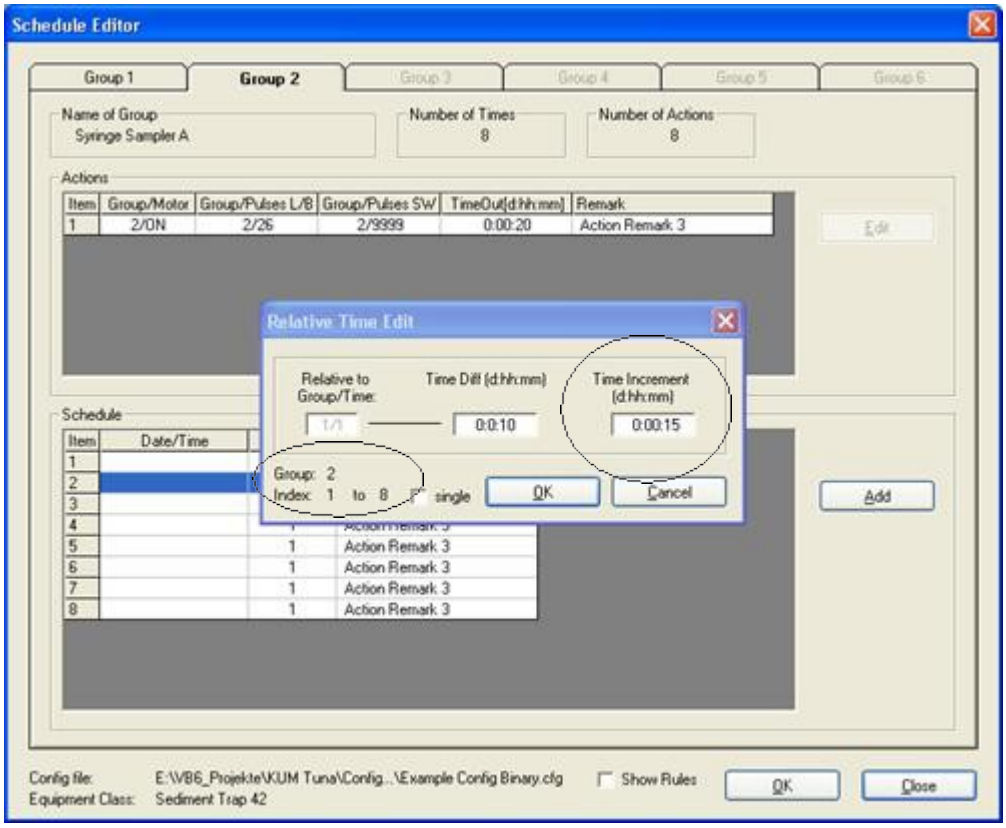


Figure 19: Entering a Series of Times Items

If a single time shall be edited only check the ‘single’ box. The index range will be limited to the currently marked time line in the schedule editor and the time difference will immediately be recalculated and be presented as the default relative time difference to the reference element.

If the input of a time item shall always be presented as a single item KUM has to adapt the config file accordingly.

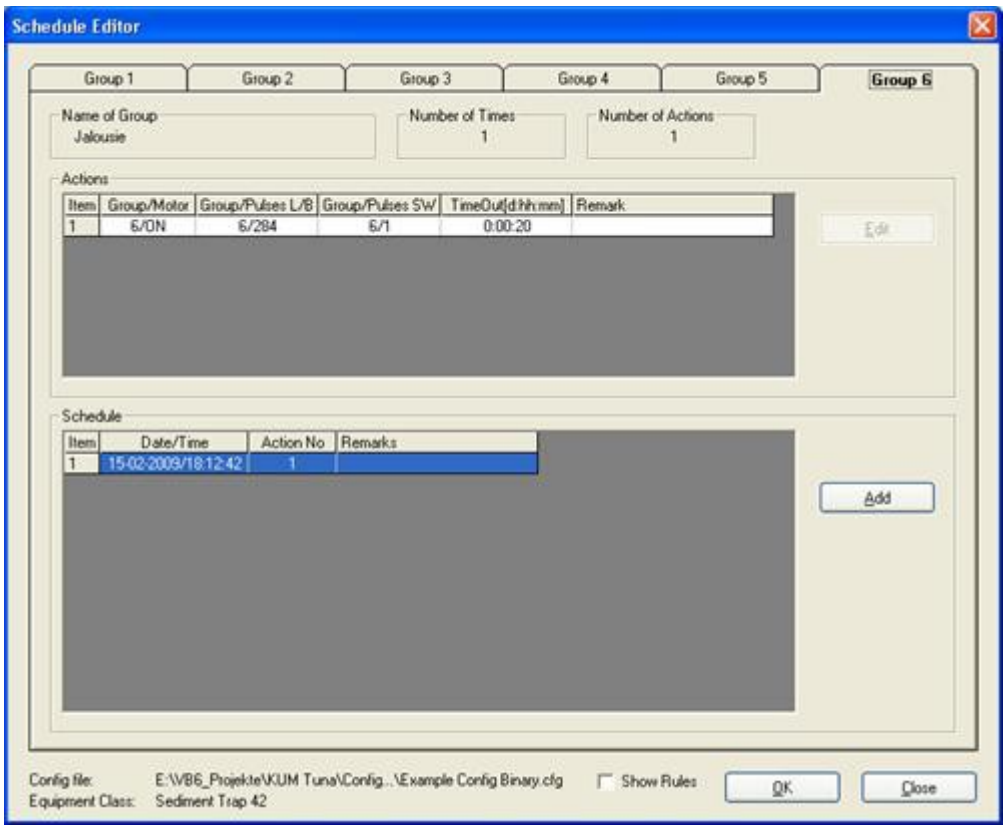


Figure 20: Full Schedule Editor

If all tabs are complete, clicking OK transfers the schedule to the main window. You can double check the entries again and you can ...

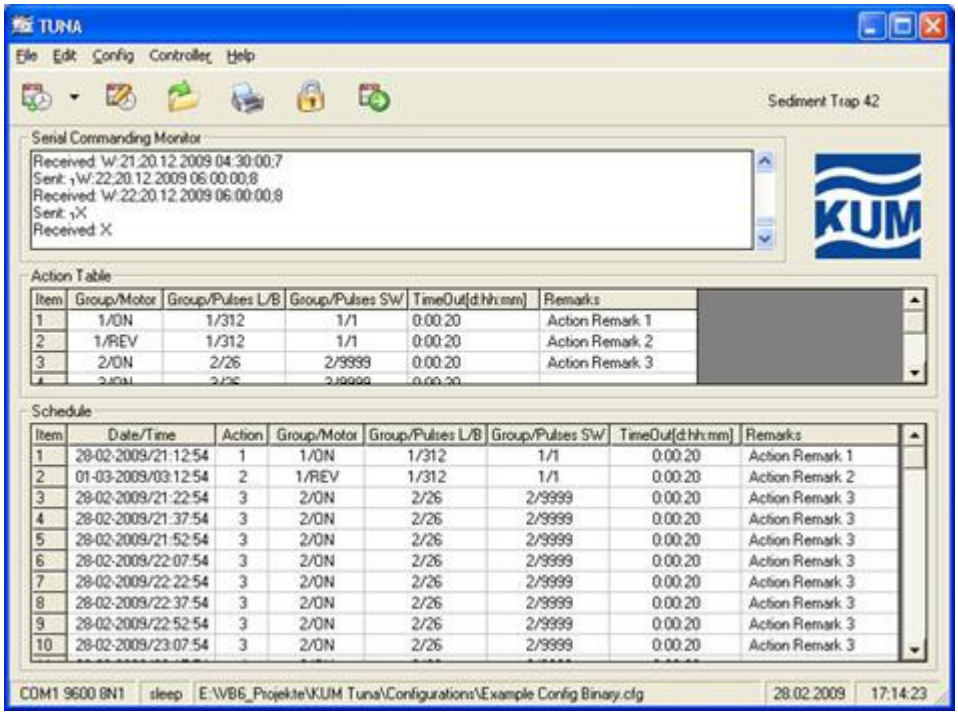
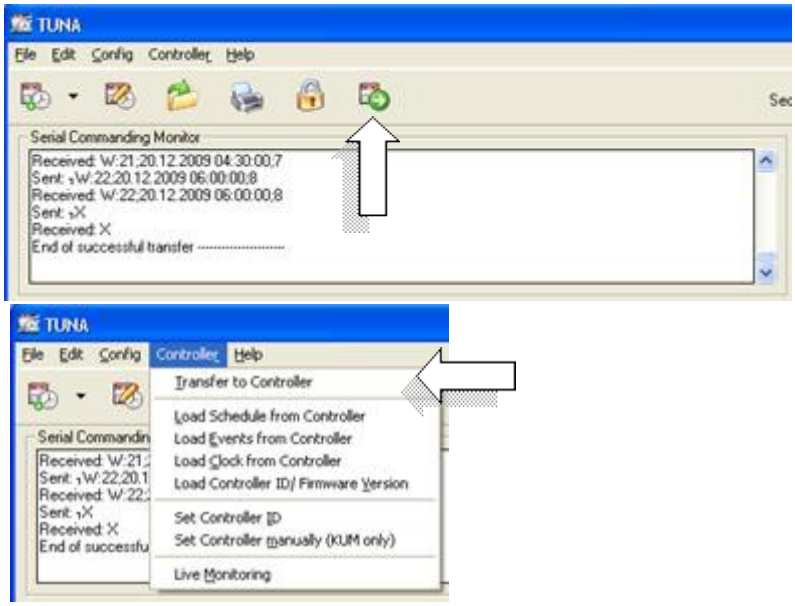


Figure 21: Schedule Transferred to the Main Window

- store the complete schedule,

- print it,

- transfer it to the controller,



- or shift the schedule to any user defined date and time

3.5 Shifting a Schedule

The Menu item Edit/Shift Schedule opens a dialogue for entering the desired date and time. TUNA uses the earliest time as reference and shifts all other time items by the time difference between it and the selected date and time.

Using this feature you can use your personal schedule again and again for years!

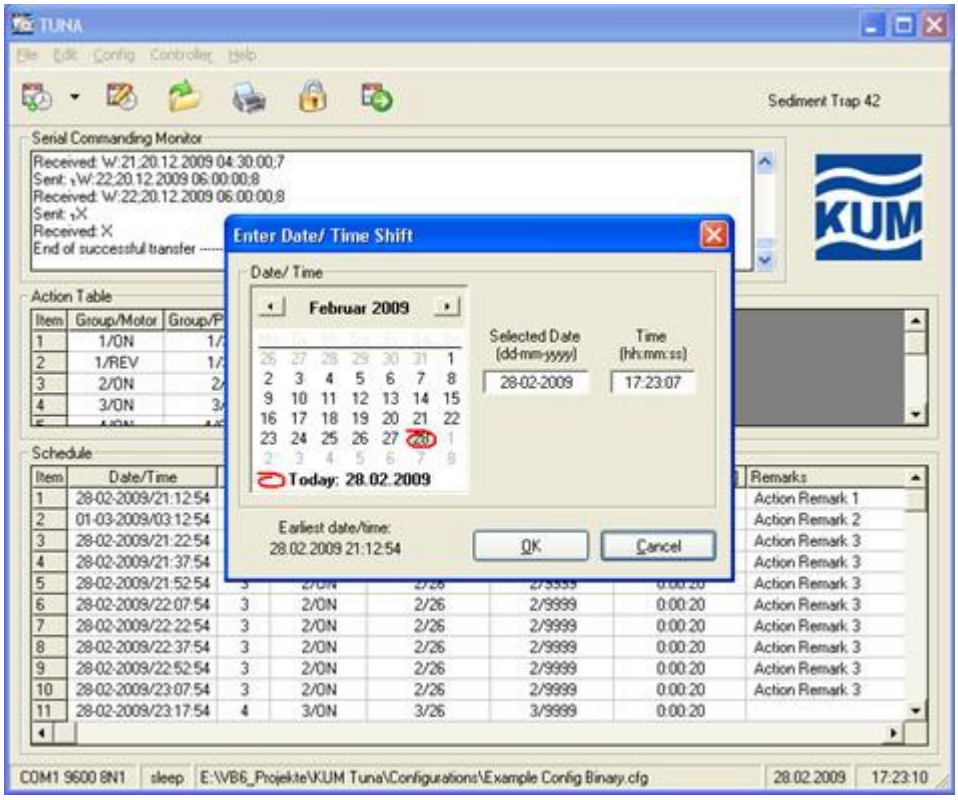
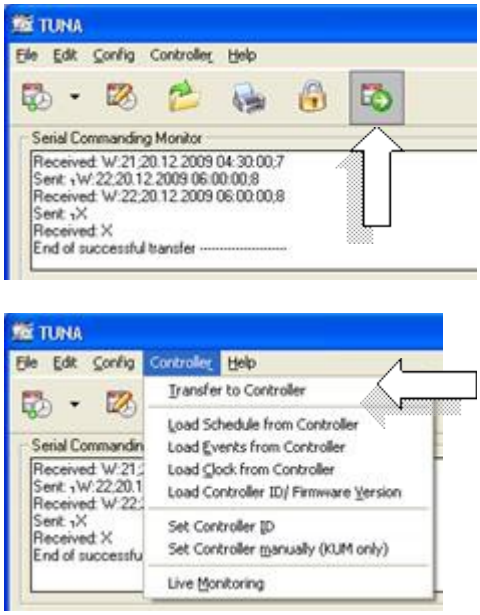


Figure 22: Shifting a Schedule to Any Date and Time

3.6 Communication with the Controller

3.6.1 Transferring Schedules to the Controller

For transferring a schedule to the controller either click on the cone icon or choose the menu item



The Serial Command Monitor of the Main Window provides you with a terminal monitor displaying the activities between TUNA and the controller. It can also be used for fault tracing by marking all concerned text and export it through the clipboard function of Windows. In case of problems please provide us with the data from this window.

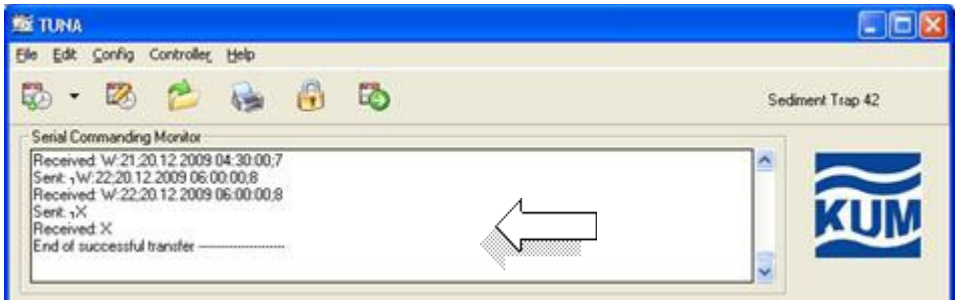
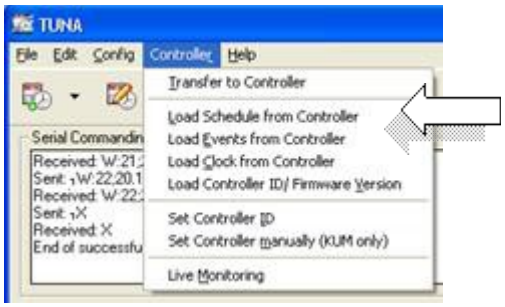


Figure 23: Serial Command Monitor

3.6.2 Loading a Schedule from the Controller

For loading the schedule from the controller select the menu item Controller/Load Schedule from Controller:



A new window displays it:

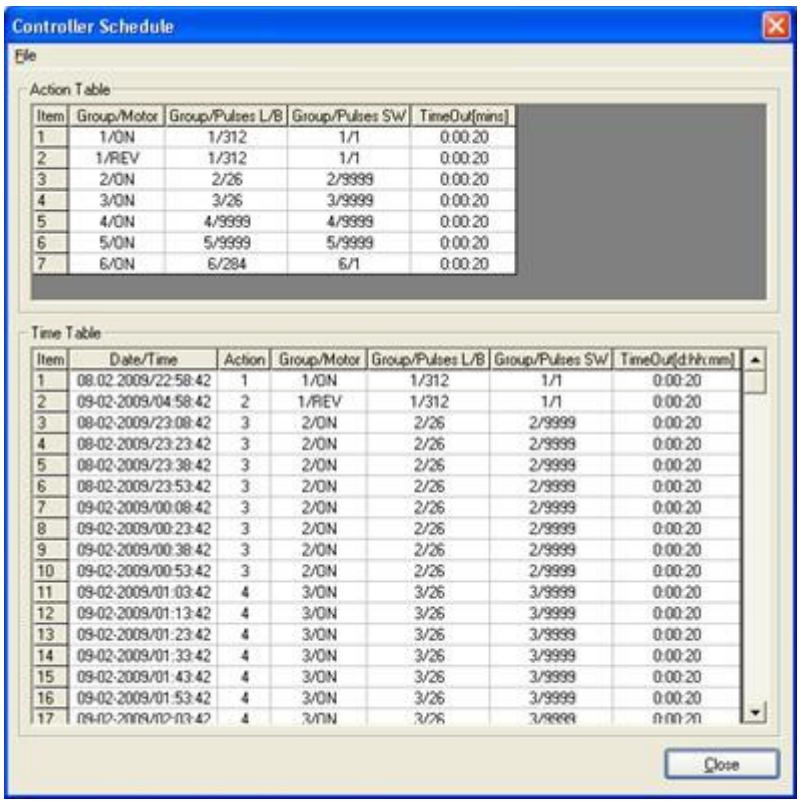
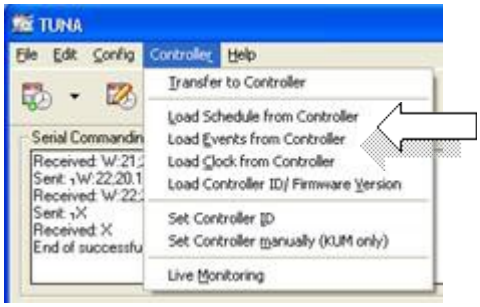


Figure 24: Loaded Controller Schedule

3.6.3 Loading Events from the Controller

For loading the Events from the controller select the menu item Controller/Load Events from Controller:



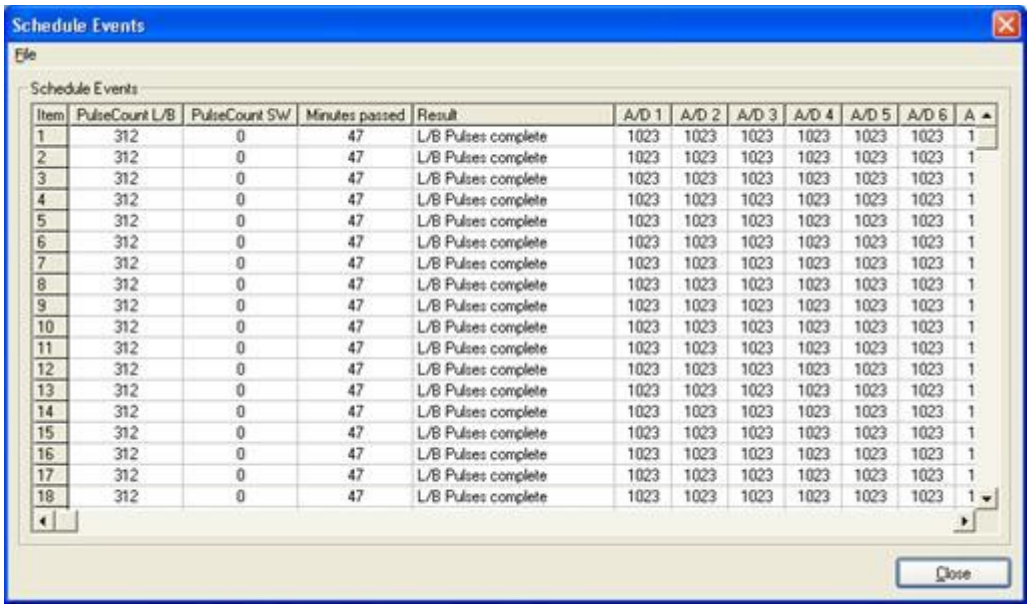


Figure 25: Schedule Events load from Controller

3.6.4 Loading the Time of the Controller Clock

To display the time of the controller clock choose the menu item Controller/Load Clock from Controller:

Figure 26: Status of Controller Clock

3.6.5 Loading the Controller ID and Firmware Version

To display the ID and Firmware Version of the controller select the menu item Controller/Load Controller ID/ Firmware Version:

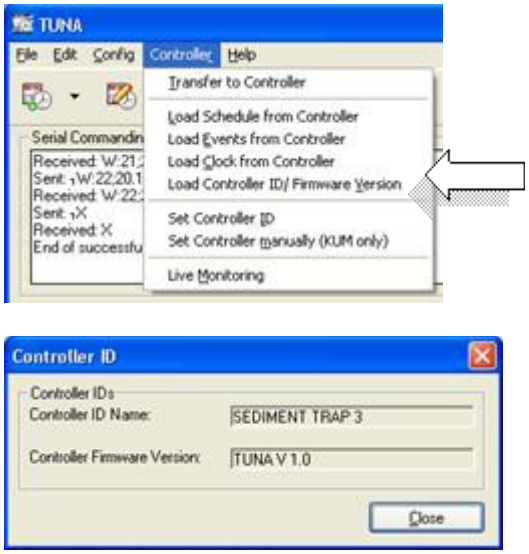


Figure 27: Displaying Controller ID and Firmware Version

3.6.6 Setting the Controller ID

To set the Controller ID select the menu item Controller/ Set Controller ID:

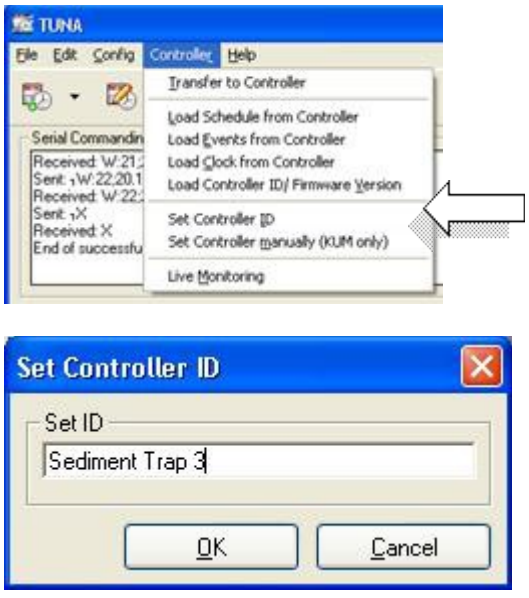


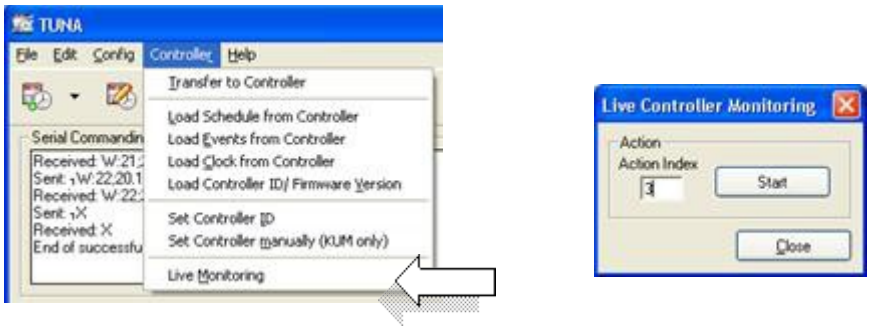
Figure 28: Setting the Controller ID

3.6.7 Live Monitoring

To test the unit and familiar with you can program it interactive.

Important Notice: Before using “live monitoring”-mode a schedule has to be transferred to controller. Otherwise the controller has no information about any “Action” and can not reply on your commands.

For live monitoring of the controller’s schedule select the menu item Controller/ Live Monitoring, select the action to be monitored, click Start



and observe the Serial Commanding Monitor for activities:

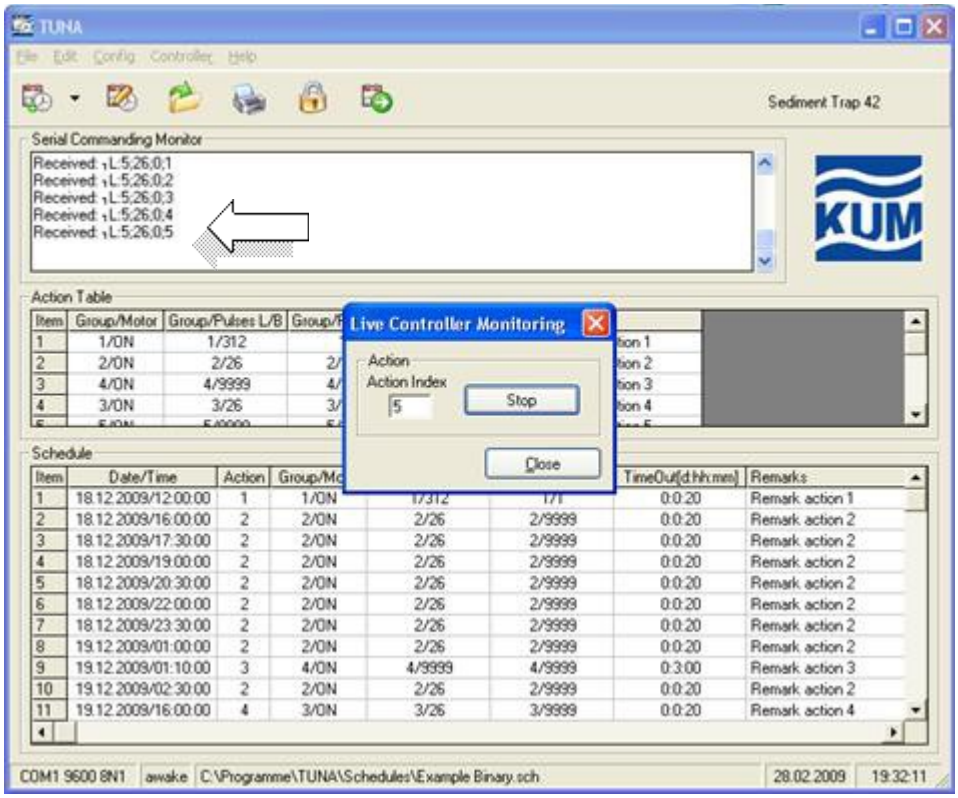


Figure 29: Live Monitoring

4 TUNA Schedule and Configuration Files

4.1 Schedule Files

TUNA provides a special syntax for Schedule and Config files. Schedules are generated by TUNA but can also be established manually by using following syntax:

```
TITLE; K.U.M. SEDIMENT TRAP 41 BOTTLES
FROM; KUM, ARNE SCHWENK
TEL; +49-431-72092-20
FAX; +49-431-72092-44
WEB; WWW.KUM-KIEL.DE
MAIL; INFO@KUM-KIEL.DE
VERSION; 0.9
REMARK; CONFIG TEST FILE

ECLASS; 2

ACTION; 1; 1/ON; 1/1; 1/1; 0:00:20;  Next Bottom Bottle
ACTION; 2; 2/ON; 2/1; 2/1; 0:00:20;  Next Upper Bottle

TIME; 1; 24-12-2009/12:00:00; 1
TIME; 2; 25-12-2009/12:00:00; 1
TIME; 3; 26-12-2009/12:00:00; 1
TIME; 4; 27-12-2009/12:00:00; 1
TIME; 5; 28-12-2009/12:00:00; 1
TIME; 6; 29-12-2009/12:00:00; 1
TIME; 7; 30-12-2009/12:00:00; 1
TIME; 8; 31-12-2009/12:00:00; 1
TIME; 9; 01-01-2010/12:00:00; 1
TIME; 10; 02-01-2010/12:00:00; 1
TIME; 11; 03-01-2010/12:00:00; 1
TIME; 12; 04-01-2010/12:00:00; 1
TIME; 13; 05-01-2010/12:00:00; 1
TIME; 14; 06-01-2010/12:00:00; 1
TIME; 15; 07-01-2010/12:00:00; 1
TIME; 16; 08-01-2010/12:00:00; 1
TIME; 17; 09-01-2010/12:00:00; 1
TIME; 18; 10-01-2010/12:00:00; 1
TIME; 19; 11-01-2010/12:00:00; 1
TIME; 20; 12-01-2010/12:00:00; 1
TIME; 21; 13-01-2010/12:00:00; 1
TIME; 22; 14-01-2010/12:00:00; 2
TIME; 23; 15-01-2010/12:00:00; 2
TIME; 24; 16-01-2010/12:00:00; 2
TIME; 25; 17-01-2010/12:00:00; 2
TIME; 26; 18-01-2010/12:00:00; 2
TIME; 27; 19-01-2010/12:00:00; 2
TIME; 28; 20-01-2010/12:00:00; 2
TIME; 29; 21-01-2010/12:00:00; 2
TIME; 30; 22-01-2010/12:00:00; 2
TIME; 31; 23-01-2010/12:00:00; 2
TIME; 32; 24-01-2010/12:00:00; 2
TIME; 33; 25-01-2010/12:00:00; 2
TIME; 34; 26-01-2010/12:00:00; 2
TIME; 35; 27-01-2010/12:00:00; 2
TIME; 36; 28-01-2010/12:00:00; 2
TIME; 37; 29-01-2010/12:00:00; 2
TIME; 38; 30-01-2010/12:00:00; 2
TIME; 39; 31-01-2010/12:00:00; 2
TIME; 40; 01-02-2010/12:00:00; 2
TIME; 41; 02-02-2010/12:00:00; 2
```

4.2 Config Files

Config files are to be created by using a standard ASCII text editor and provide a syntax as described in the following example. The creation and modification of ASCII-Config-files is **solely and without any exception** confined to KUM services only!

```
'KUM Configuration File
'Reference Data  ######################################################################
'[TITLE]; {a}
'[FROM]; {a}
'[FON]; {a}
'[FAX]; {a}
'[WEB]; {a}
'[MAIL]; {a}
'Example:
'TITLE; K.U.M. TUNA Timing-File
'FROM; KUM
'FON; +49-431-72092-20
'FAX; +49-431-72092-44
'WEB; www.kum-kiel.de
'MAIL; info@kum-kiel.de

'Equipment Class ######################################################################

'Format:
'[ECLASS]; {a}

'Example:
'ECLASS; 3

'a=[1] for Sediment Trap 21 probes
'  [2] for Sediment Trap 41 probes
'  [3] for Lander or
'  [4] for User Defined or
'  [5] for Factory Test
'  [6] for Others
'#############################################################################################


'Rules for Group Naming ################################################################

'Format:
'[GName]; {Group}; {Name of Group}

'Example:
'GName; 1; Bottom Sample Changer
'#############################################################################################


'Rules for times #######################################################################

'Format:
'[TRULE]; {Group}; {From}; {To}; {[MIN]or[MAX]or[DIF]}; {[LOC]}or{Group/Index} ;
{TimeDiff<d:hh:mm>}; {Error Message}

'Examples:
'TRULE; 1; 1; 1; MIN; LOC; 3:00:00; Start time too early          'Time 1 in Group 1 to be
>=local time +3days
'TRULE; 2; 1; 8; MIN; 1/1; 0:10:00; No sample before pushing chamber      'Times 1-8 in Group 2
to be >=Time 1 in Group 1 + 10mins
'TRULE; 3; 1; 8; MIN; DIF; 0:10:00; At least 10 mins between samples      'Time 1-8 in Group 3 to
have a minimum distance of 10mins

'TRULE:        Command Token for Time Rule
'Group:        Group to which this rule applies
'From/To:      Applies from time line x to time line y
'MIN:          Minimum
'MAX:          Maximum
'DIF:          Differenz
'LOC:          Local Time
'Group/Index:  Reference time Group/ Index
'd:hh:mm:      Time Difference (days:hours:minutes) days0-365, hours 0-23, minutes 0-59
```

```
'Error message:       Error message to occur if incompliant to this rule
'################################################################################


'Action Rule ###################################################################

'Format:
'[ARULE]; {Group}; {From}; {To};
'{[F]or[V]/[ON]or[REV]};                                                    'Motor
'{[F]or[V]/[DefPulses]/[MinPulses]/MaxPulses]};                             'Light Barrier Sensor
'{[F]or[V]/[DefPulses]/[MinPulses]/MaxPulses]};                             'Switch sensor
'{[F]or[V]/DefTimeOut<d:hh:mm>/MinTimeOut<d:hh:mm>/MaxTimeOut<d:hh:mm>}     'Timeout
'{[Remark]}                                                                 'Remark

'Example:
'ARULE; 1; 2; 2; F/REV; V/312/20/500; V/1/1/500; V/0:00:20/0:00:20/0:01:00; Turn Trap

'ARULE:        Command Token for Action Rule
'Group:        Group to which this rule applies
'From/To:              Applies from time line x to time line y
'F/V:          Fixed/ Variable               (Light Barrier)
'DefPulses:            Default pulse Count           (Light Barrier)
'MinPulses:            Pulse Count changable from    (Light Barrier)
'MaxPulses:    to                    (Light Barrier)
'F/V:          Fixed/ Variable               (Switch)
'DefPulses:            Default pulse Count           (Switch)
'MinPulses:            Pulse Count changable from    (Switch)
'MaxPulses:    to                    (Switch)
'DefTimeOut:   Default TimeOut
'MinTimeOut:   changable from
'MaxTimeOut:   to
'Remark:       Remark about what this action does
'################################################################################


'Rules for Time Input ##########################################################

'Format for absolute time input:
'[IRULE]; {Group}; {From}; {To}; {[ABS](/DifLocal<d:hh:mm>)}                     'If From=To
( one time only)
'[IRULE]; {Group}; {From}; {To}; {[ABS](/DifLocal<d:hh:mm>)}; {Incr<d:hh:mm>}    'If From<>To

'Format for relative time input
'[IRULE]; {Group}; {From}; {To}; {Group/TimeDif<d:hh:mm>}                'If From=To (one time
only)
'[IRULE]; {Group}; {From}; {To}; {Group/TimeDif<d:hh:mm>}; {Incr<d:hh:mm>}       'If From<>To
'[IRULE]; {Group}; {From}, {To}; {LOC/(/DifLocal<d:hh:mm>)}                      'If From=To
(one time only)
'[IRULE]; {Group}; {From}, {To}; {LOC/(/DifLocal<d:hh:mm>)}; {Incr<d:hh:mm>}     'If From<>To

'Examples
'Input rule for group 1/ times 1 to 1:
'Absolute time input with default = local time + 3 days
'IRULE; 1; 1; 1; ABS/0:04:00

'Input rule for group 1/ times 2 to 2:
'Relative time input with default = group 1/ time 1 + 6 hours
'IRULE; 1; 2; 2; 1/1/0:06:00;

'Input rule for group 2/ times 1 to 8:
'Relative time input for time 1 with default time difference to group 1/time 1 of 10 mins
'and a time difference for times 1 to 8 of default = 15mins
'IRULE; 2; 1; 8; 1/1/0:0:10; 0:00:15

'Input rule for group 1/ time 1 to 1:
'Relative time input for time 1 with a default time difference to local time of 4 hours
'IRULE; 1; 1; 1; LOC/0:04:00

'################################################################################
'################################################################################
'################################################################################
'################################################################################
'################################################################################
'################################################################################
'################################################################################
'################################################################################


'Start of Configuration ++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

```
'Reference Data
TITLE; K.U.M. Sediment Trap 41 bottles
FROM; KUM, Arne Schwenk
FON; +49-431-72092-20
FAX; +49-431-72092-44
WEB; www.kum-kiel.de
MAIL; info@kum-kiel.de
VERSION; 0.9
REMARK; Config Test File

'Equipment Class
ECLASS; 2

'Number of Groups
NGROUPS; 2

'Rules for Group 1 (Bottom Bottle Changer) ========================================

'Name of Group
GName; 1; Bottom Bottle Changer

'Rules for Time 1 ---------------
'IRULE; 1; 1; 1; LOC/0:12:00
IRULE; 1; 1; 1; ABS/0:12:00
TRULE; 1; 1; 1; MIN; LOC; 0:3:00; Start time too early
TRULE; 1; 1; 1; MAX; LOC; 60:0:00; Start time too late

'Rules for Time 2-21 -------------
IRULE; 1; 2; 21; 1/1/1:00:00; 1:00:00
TRULE; 1; 1; 21; MIN; DIF; 0:0:10; At least 10 mins between samples
TRULE; 1; 1; 21; MAX; DIF; 30:0:00; Max. 30 days between samples
ARULE; 1; 1; 21; F/1/F/ON; F/1/F/1; F/1/V/1/1/50; V/0:00:20/0:00:05/0:05:00; Next Bottom Bottle


'Rules for Group 2 (Top Bottle Changer) ==========================================
'Name of Group
GName; 2; Top Bottle Changer

'Rules for Time 1-20 ---------------
IRULE; 2; 1; 20; 1/21/1:0:0; 1:0:0
TRULE; 2; 1; 20; MIN; 1/21; 0:0:10; No sample before Bottom Sampler finished
TRULE; 2; 1; 20; MIN; DIF; 0:0:10; At least 10 mins between samples
TRULE; 2; 1; 20; MAX; DIF; 30:0:00; Max. 30 days between samples
ARULE; 2; 1; 20; F/2/F/ON; F/2/F/1; F/2/V/1/1/50; V/0:00:20/0:00:05/0:01:00; Next Upper Bottle

'
'End of Configuration ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```