



Cyclone head



User Manual

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easySPT300 Reverse flow Cyclone Sampler Cyclone Heads

Summary

1	CYCLONE GROUP.	3
1.1	GENERAL DESCRIPTIONS.	3
1.2	PRECAUTIONS	4
1.3	DRUM EXTRACTION AND INSERTION.	5
1.4	EXTRACTION/ INSERTION OF CYCLONE HEAD FROM COVER.	7
1.5	CYCLONE DESCRIPTION AND MAINTENANCE.	8
1.6	FAILURES AND RECOVERY.	9



easySPT300

Cyclone Head

Date:
25/06/2024

Revision:
1.00

Page:
2 / 10

1 Cyclone Group.

The cyclone group is composed by three main parts:

- The Cyclone head.
- The base derived from easySPT100.
- The cover

The base has been described in the previous chapter and is derived from easySPT100 to allow an easy conversion from one system to the other and vice versa.

In this chapter we describe the composition and functionality of the other parts.

1.1 General descriptions.

As explained the base of the instrument is derived from easySPT100. The Cyclone head can't fit inside the space available, for this reason we modified the cover realizing a new one as per image. The perimeter of the cover remains the same of the easySPT100 but we have modified the height. Thanks to this intervention the compatibility of the two systems are guaranteed.

The Cyclone head is composed by the following parts:

1. Reverse flow Cyclone.
2. Fixing point for cover.
3. Rotation motors.
4. Drum for Eppendorf.

The Cyclone head is completely autonomous, it's provided of all necessary parts for an 8 days sampling and need only an external power supply sources to function. The two motors (3) allow all movements necessary for rotation of drum and Eppendorf change.

We used two motors to allow movement in two directions: up/down and left/right.


The Drum (6) is composed of two parts:

- The main drum with 7 hole designed to accommodate a 1.5ml Eppendorf.
- A "clip" for the 8th Eppendorf to close the drum.

The meaning of 8 Eppendorf for 7-Days sampling period is to give to the user the possibility to change drum the 8th days without loss of samples allowing an uninterrupted sampling. The system can be configured for manual or automatic function. In manual the drum is rotated manually by pressing a combination of buttons of the user interface. In automatic the system changes Eppendorf automatically with a timing that can be set by user (from 1 up to 99 hours). Using the four fixing points (2) the head can be fixed to the cover in an easy manner without use of screw or Allen key. The Cyclone (1) can be opened to be cleaned. The internal electronic control the followings operations:

- Control the two motors.
- Check the right positioning of the drum during rotations.
- Check possible fault during rotation to avoid breakage.
- Communicate with user interface.



	easySPT300	Date: 25/06/2024
	Cyclone Head	Revision: 1.00
		Page: 3 / 10

1.2 Precautions

As explained before the Cyclone head need to be supplied to function and also needs to communicate with the user interface. For these reasons we provided the Pump group with a little connector on the front (Fig1.2.1). The Cyclone head is provided with a cable (Fig.1.2.2) that fit in this connector and that provide all necessary signals.

Fig 1.2.1



Fig 1.2.2



Fig. 1.2.3



The connector can be disconnected to separate head form base.

Care must be taken when connect or disconnect connectors in particular the instrument must be switched off. To switch off instrument you can wait the automatic switch off in Standby or by pressing the little button on the rear of the user interface (Fig.1.2.3). To disconnect connector please press the little tab on the connector before extract it, like in the below image (Fig.1.2.4), and pull form connector and not from wires.

Fig.1.2.4



Fig.1.2.5



Fig.1.2.6



When you close the cover of the instrument takes care to insert the cable inside instrument on the left of the cyclone head (Fig.1.2.5). Remember to close the knob (Fig.1.2.6), to avoid head movement.

The cable length allows group positioning for Eppendorf extraction (Fig.1.2.7) and Cyclone head extraction/maintenance (Fig.1.2.8).

Fig.1.2.7

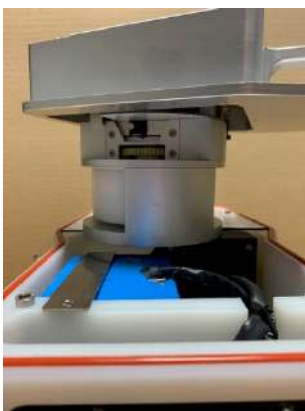


Fig.1.2.8



1.3 Drum extraction and insertion.

1.3.1 Drum positioning.

The positioning of the drum is one of the main functions of the electronics in the cyclone head. The positioning of the drum is done by two motors and two microswitches. The two microswitches are used one to detect the 1th Eppendorf and the other to detect the position of each Eppendorf. Each time a switch is initiated, the electronics emits a number of different types of acoustic signals to inform the user of the status of the movement. In particular the possible beeps emitted are:

- Two consecutive long (1sec) beeps when movement start.
- One short (0.5sec) every time that an Eppendorf transit below Cyclone hole.
- Two consecutive short (0.5 sec) beeps when reached the selected Eppendorf.
- One long beep (2 sec) at the end of the movement.

These beeps are useful when a commutation is performed to identify the end of a process to avoid Cyclone disconnection before. The two motors allow a drum movement in any direction. On the top of the “cavity” where drum is contained, is present a rubber circle acting as a gasket for the Eppendorf not used except for the one under sampling. To be able to rotate drum, and change Eppendorf, it’s necessary to free drum from this gasket by moving it downward. Contrary, when the system changes the sampling Eppendorf by rotating the drum, at the end of movement is moved upward to reach this gasket and seal not used Eppendorf. In general typical movement of the drum is: move down, rotate of one step and goes up.


Drum movements occur in the following situations:

- Start of the instrument. When the instrument is STARTED, by holding pressed the OK button for at least 3 sec, a START command is also sent to Cyclone head that rotate the drum up to the 1th position.
- Stop of the instrument. When the instrument STOPS, by holding pressed the OK button for at least 3 sec, a STOP command is also sent to Cyclone head that rotate the drum up to the extraction position.
- Automatic change of the Eppendorf at the end of sampling period when the instrument is in automatic. Every time a sampling period end a NEXT command is sent to the Cyclone head.
- Manual movement by pressing [OK+←] or [OK+→] when the instrument is configured in manual. By pressing these buttons a command of previous or next Eppendorf is sent to Cyclone head.

1.3.2 Synchronize drum position.

Sometimes may occur a de-synchronization of the drum position. (the electronic consider the actual position different from the real position). To re-synchronize electronics is necessary to send to Cyclone head a START command. The START command is sent by user interface when user press OK button for at least 3 seconds. If the instrument is in STOP conditions press button to start it, otherwise if it’s already in START, STOP it by pressing OK button for 3 seconds. Wait the end of procedure by listening the beeps or by reading the display (MOVEMENT). Repeat pression to start it.

In both cases the end result is a re-synchronization of the drum position. Now instrument is ready.

	easySPT300	Date: 25/06/2024
	Cyclone Head	Revision: 1.00
		Page: 5 / 10

1.3.3 Extraction or insertion of drum.

Eppendorf are contained in the drum and for this reason to change them isn't necessary to unmount all head but only to extract it. Drum is contained in a "cavity" with two openings like in the images. One (Fig.1.3.3.1) is larger than the other (Fig.1.3.3.2), this is the side where drum enter and exit. The other is where you can extract the 8th Eppendorf and apply pressure to extract drum.

Fig. 1.3.3.1

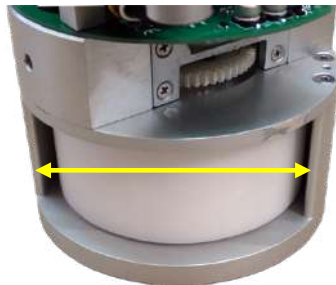
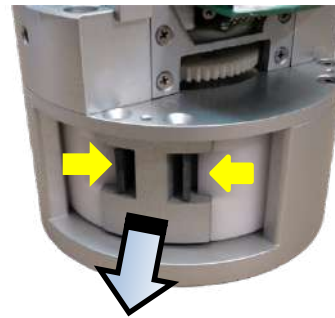


Fig.1.3.3.2

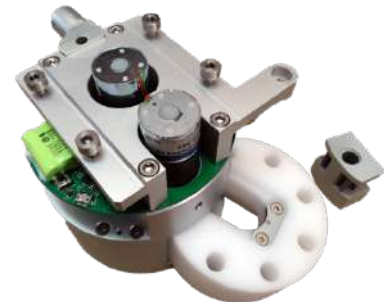


To extract the 8th Eppendorf press the two plastic springs, indicating by the two yellow arrow, and simultaneously pull outside to extract it (blue arrow in Fig.1.3.3.2 and Fig.1.3.3.3). Now plastic drum is free to exit so apply light pressure (Fig.1.3.3.4) to release the drum from its seat. Be careful to not exaggerate to prevent the drum from exiting quickly and falling to the ground. Indeed the drum is held in place by a spring-pressor with a slight resistance and for this reason when you press it there is a little resistance at the start of pressure that suddenly becomes lighter.

Fig.1.3.3.3



Fig.1.3.3.4



The extracted drum can be stored in the custody with Eppendorf inside to be carried to laboratory, or each Eppendorf may be extracted singularly. To reload a new drum remember to follow the previous steps backwards. Remember that the 8th Eppendorf, if you need an uninterrupted sampling, must be inserted in the new drum in position 1 because you need to continue the interrupted sampling. In the image on the right you can see a drum with the 8 positions representing the days. The rotation of the drum is in clock-wise direction. Under each hole there is a "conic hole" to facilitate the finger insertion and the extraction of the Eppendorf. We suggest however to carry all Eppendorf inside drums and extract



them only in laboratory to avoid any problem. The photo sequence on this page was made with the Cyclone head extracted from the cover only for convenience and to be able to get detailed photos. We suggest to extract the drum without disassembling it from the cover, placing the base of the cyclonic head on a plane, as shown in the left picture, because the weight of the head keeps the whole group in balance allowing the extraction procedure.



easySPT300

Cyclone Head

Date: 25/06/2024
Revision: 1.00
Page: 6 / 10

1.4 Extraction/ Insertion of Cyclone head from cover.

This operation is only necessary if you need to clean the Cyclone or you need to send the head to our factory to be repaired. These are the only two reasons why we suggest to extract head from cover as it is an operation that require a certain manual ability.

The images on the right represent the sequence of operations to extract/insert the Cyclone head inside the cover. In the cover is present a rectangular site with two rails. In each rail are present two slots, similar to a keyhole, to accommodate the fours fixing point of the Cyclone head.

The steps are:

- Align the fours fixing point of the head with the four slots (1).
- Insert the head into the slots (2).
- Press the rear of the head in the direction of the front hole (3). The front hole is provided with a seal O-ring (6) and for this reason you have to press hard enough to overcome it resistance. Before check that Cyclone is perfectly aligned otherwise you can't insert it in the front hole.



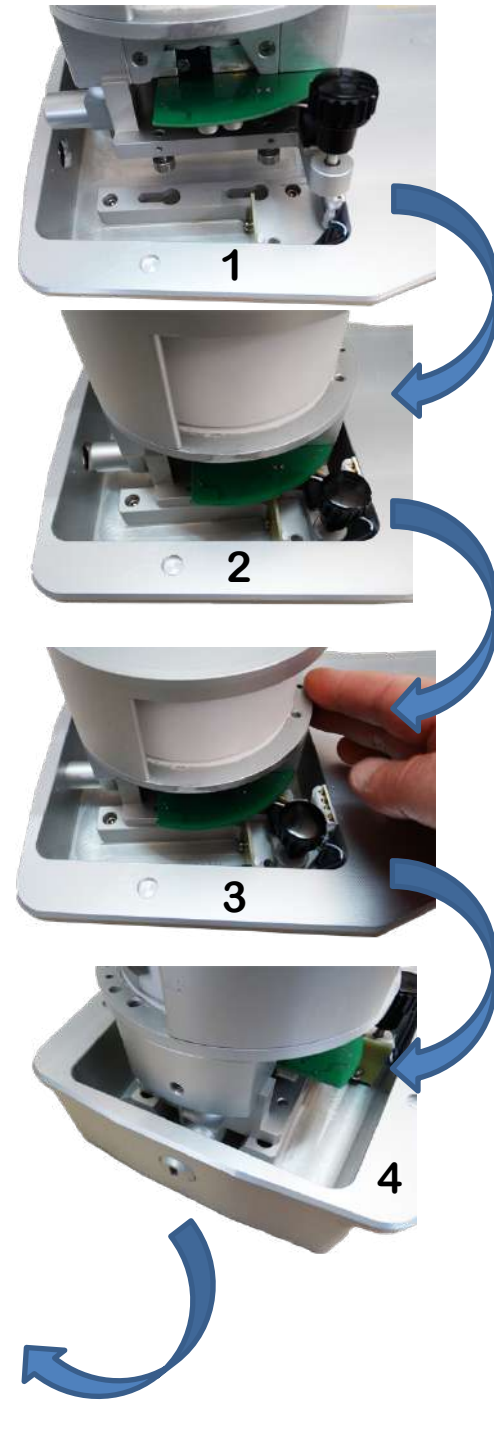
- Stop pressing when the end of the slots is reached (you understand that because doesn't go any further). If you check the front hole you can see that the Cyclone inlet stick out of some mm (4).
- Fix the head to the cover by screwing the provided knob. Remember that if the head isn't completely inserted (the threaded hole isn't aligned with knob) you can't screw it (5).


At this point the Cyclone head is fixed to the cover and ready to start.

Remember that the procedure to extract the head is the same:

- Unscrew knob.
- Push the head backward to nozzle from the front hole.
- Pull the head up to extract it from cover.

Now the Cyclone head is free and ready to be inspected.



	easySPT300	Date: 25/06/2024
	Cyclone Head	Revision: 1.00
		Page: 7 / 10

1.5 Cyclone description and maintenance.

The cyclone is completely in aluminum and the internal part of it is treated to be resistant to particles transported by air flow and sufficiently smooth to avoid, as much as possible, that dust and particles will settling on it.

We suggest to clean it frequently to avoid loss in capture efficiency.

In the previous chapter we described the procedure to extract the Cyclone head from cover.

One time you have the head in your hand you can extract the Cyclone by performing a little rotation while pulling. Remember that the lower part of the Cyclone is inserted into a hole with a sealing O-ring, this O-ring increase the resistance both for extraction and insertion. Exert a certain amount of force to insert or extract the Cyclone from its housing.

The Cyclone is composed of three parts:

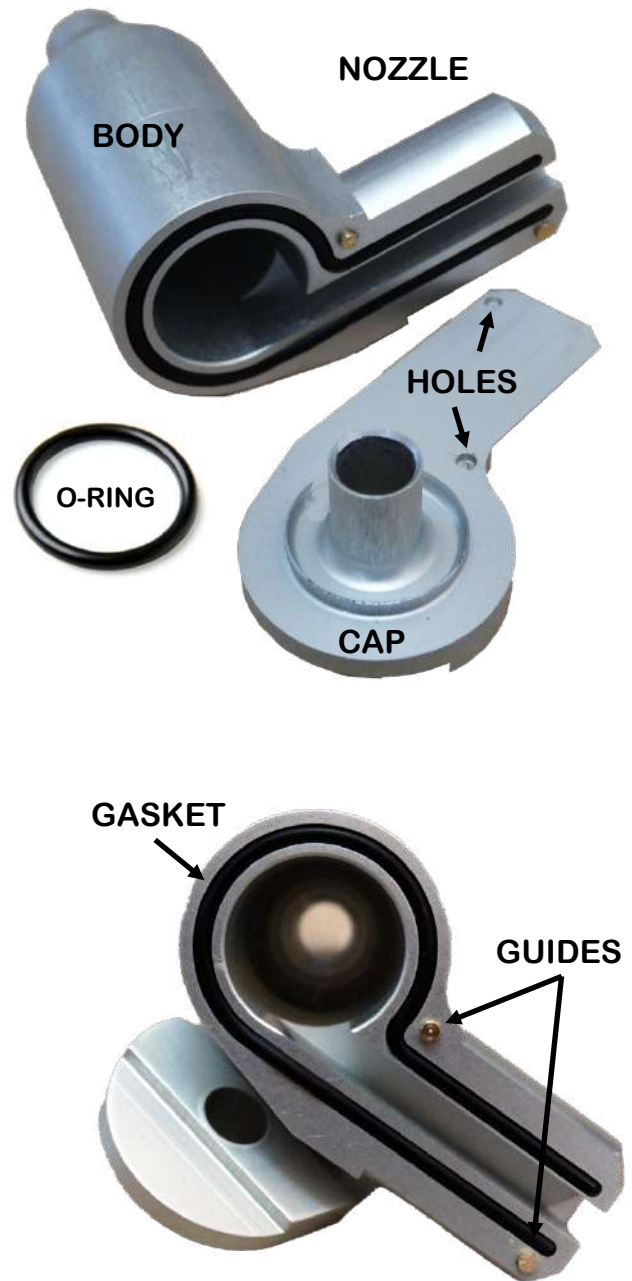
- **BODY.**
- **CAP.**
- **O-RING**


In the **BODY** there are two little cylindrical **GUIDES** while in the cover there are two **HOLES** in correspondence of these **GUIDES**.

In the **BODY** there is also a slot in which is inserted a rubber **GASKET**. Always check this **GASKET** before close the Cyclone to avoid losses of suction capacity due to a wrong insertion or a broken part.

We provide the Cyclone with a rubber band around **NOZZLE**, usually is an **O-RING**, to maintain **CAP** strictly closed to **BODY**.

To clean the internal of the Cyclone please use a “gentle hair brush” to avoid damages that can compromise the correct function of the Cyclone. We suggest to use also solvent like alcohol to improve the brush effect, avoid any type of oil or grease!!!



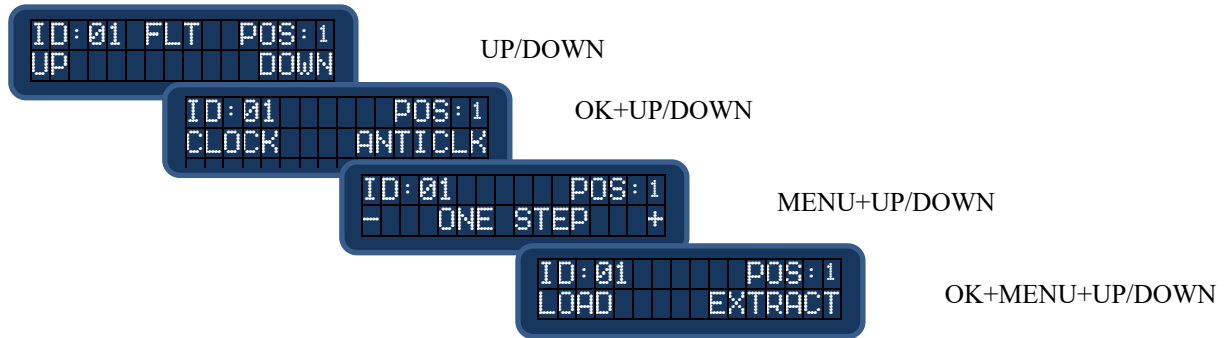
	easySPT300	Date: 25/06/2024
	Cyclone Head	Revision: 1.00
		Page: 8 / 10

1.6 Failures and recovery.

The Cyclone head is composed of some mechanical part in movement, in particular the Eppendorf drum that can move in four directions. During movements may happens that something going wrong, for example an obstacle between drum and container, generating a stop of all movements and the generation of a failure.

If batteries are too low may also happens that during a movement a failure takes place.

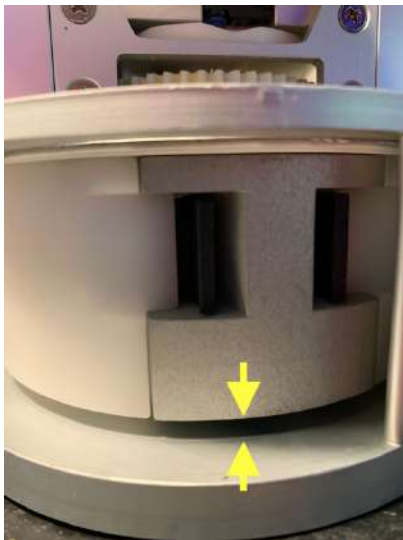
In these situations the electronics stop movement, to protect motors and batteries, and generate a fault. The display will change to show this situation and after that the only possibilities is to try manually to recover system.



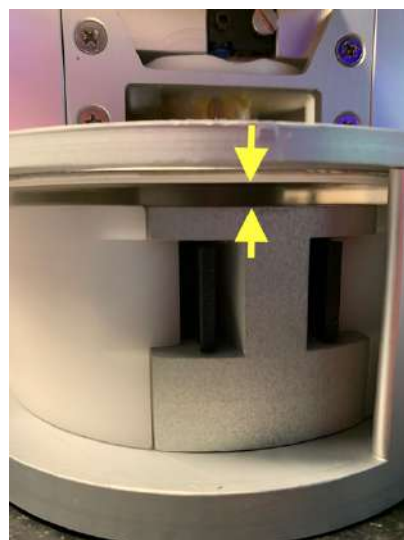
There are three main situations that may generate a failure:

- Failure in Top position.
- Failure in Bottom position.
- External obstacle.

Drum at the Top Position




Drum at the bottom position



In the top position, image on the left, you can see that drum touch top and there is space below as indicated by the two yellow arrows. In the bottom position, right image, you can see that drum touch bottom and there is space on the top as indicated by the two yellow arrows. These are the extreme of the drum vertical movement and may cause problems, in particular the top position where is provided a deformable rubber seal.

In the top position possible movements can be DOWN and CLOCK. In particular CLOCK movement rotate in clockwise, looking the cyclonic group from above, but at the same time goes down.

	easySPT300	Date: 25/06/2024
	Cyclone Head	Revision: 1.00
		Page: 9 / 10

easySPT300 Reverse flow Cyclone Sampler Cyclone Heads

In the bottom position possible movements can be UP and ANTICLOCK. In this situation the ANTICLOCK rotate in anti-clockwise, by looking the cyclonic group from above, but at the same time goes up.

To try to recover situation follows these suggestions:

- Try to move in CLOCK and ANTICLOCK direction even if you can't notice any movement but only some rumors. This is important because if the rotation axis of the system is just a little bit "not in axis" with this movement may return in position.
- After try to move UP and DOWN even if you can't see any movement but only some rumors.
- If the system is in the TOP position try the CLOCK movement and help the clock rotation with your hand applying slight pressure to the drum in the direction of rotation. Opposite in case of bottom position where you have to try the ANTICLOCK rotation.
- Remember that Vertical movement are very slow so wait some seconds to see some movement.
- The goal is to distance, just a little bit, drum from top or bottom position to allow movement in all directions. Once achieved, check that movement is indeed possible in all directions using the button combination.
- Help the movement trying to force rotation with your hand. Do not force too much drum rotation because is sufficient a little force.


Some rules:

- Connect instrument to external power supply, when trying these operations, to be sure to have a sufficient and stable supply.
- The "ONE STEP" operation allow movement up to the limit. So if "Pos = 9" and you try + movement nothing happens because 9 is the last Eppendorf. The same for - movement if you are in the "Pos=1".
- In the first and second operations there isn't any type of check so please avoid to continue the movement if you reach the limit. In particular UP and DOWN but also CLOCK and ANTICLK because when rotate also move up and down and you can reach the limit. CLOCK rotation goes down and ANTICLK rotation goes up.

The external obstacle can be easily determined and solved so the solution will be to remove it.

At the end of all tests, when the drum can move easily in each direction, you can restore system by pressing together the buttons DOWN+UP. The text FLT on display will disappear and after you restart system, by pressing the reset button on the rear of the user interface, it will restart normally.

Remember that if you don't reset FLT with the buttons, each time the system restart it will present always the same restore menu and you can't access to the normal functionality.

	easySPT300	Date: 25/06/2024
	Cyclone Head	Revision: 1.00
		Page: 10 / 10