RWD Osmotic Pump
User Manual

1-Introduction

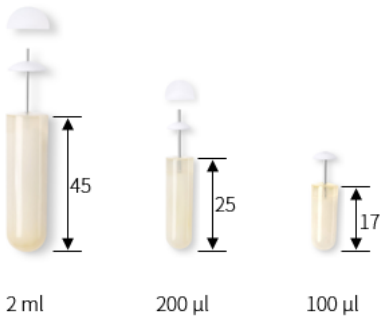
RWD Osmotic Pump is a kind of miniature implantable pumps. Osmotic pressure serves as the power to continuously and uniformly deliver solutions to the target location. Implant into specific parts of experimental animals for targeted delivery and effectively alleviating stress response. RWD Osmotic Pump can be widely used in drug screening, animal disease model establishment and other fields.

Use restriction!

Only used for experimental animals!

Not for use in humans!

Not for economic animals such as pets and consumption animals!



2-Product List

At present, RWD Osmotic Pump have 3 models: 100 µl models, 200 µl models and 2 ML models.

	100 µl models	200 µl models	2 ML models
10 osmotic pumps	√	√	√
10 flow moderators	√	√	√
10 caps	×	√	√
10 flow moderators without flange	√	×	×
1 disposable filling tube	√	√	√

Note: All contents have been sterilized by a ^{60}Co radition. These products are effective for only one year. If your product is expired, RWD cannot guarantee that the pump works well.

3-Specification

3.1 RWD Osmotic Pump with Flow Moderator

- Nominal Performance (at 37°C)

Models	Model	Pumping Rate (μl/hr)	Duration (days)	Reservoir Volume
100 μl	1003D	1.0 (± 0.15)	3	100 μl
	1001W	0.5 (± 0.07)	7	
	1002W	0.25 (± 0.04)	14	
	1004W	0.13 (± 0.02)	28	
200 μl	2003D	2.0 (± 0.3)	3	200 μl
	2001W	1.0 (± 0.15)	7	
	2002W	0.5 (± 0.07)	14	
	2004W	0.25 (± 0.04)	14	
2 ML	2ML1W	10.0 (± 1.5)	7	2 ml
	2ML2W	5.0 (± 0.75)	14	
	2ML4W	2.5 (± 0.38)	28	

Note!

There is an acceptable nuance of various batches of pumps between actual performance and nominal performance.

The actual pumping rate and fill volume are on the product labeling.

- Overall Dimensions

Models	Length	Diameter	Total Displaced Volume
100 µl	1.9 cm	0.6 cm	0.6 ml
200 µl	2.8 cm	0.7 cm	0.9 ml
2 ML	5.3 cm	1.35 cm	6.0 ml

3.2 Components

- Filling Tube

Models	Length (tube only)	Gauge (tube only)	O.D. (tube)	I.D. (tube)
100 µl	20 mm	27 G	0.4 mm	0.2 mm
200 µl	30 mm			
2 ML	40 mm			

- Flow Moderator

Models	100 µl	200 µl	2 ML
Length (overall)	15 mm	25 mm	45 mm
Gauge (tube)	21 G		
O.D. (tube)	0.8 mm		
I.D. (tube)	0.5 mm		
Weight (overall)	0.15 g	0.2 g	0.9 g
Material (cap)	Silicone rubber		
Material (flange)	styrene acrylonitrile		
Material (tube)	stainless steel		

4-Cautions

1) RWD osmotic pumps are disposable and cannot be reused.
2) The working environment of RWD Osmotic Pump is about 37°C and the osmolality is 310 milliosmols/l approximately. Otherwise, the pumping rate will be nonuniform.
3) Requirements of the solution:

- The solution must be stable in the vehicle solution at 37°C.
- The solution should not generate gases in the pump which can make the pumping rate nonuniform.
- For sterility of the solution, use a 0.22 μm syringe-end filter to fill the pump.
- If there exist precipitated particles in the solution, it must be filterd before use.
- RWD osmotic pumps can deliver the uniform suspensions with no precipitate and uniformly viscous solutions with a viscosity of less than 100,000 centipoise.

4) The solution should be biocompatible with the material of the solution reservoir, the tissue and interstitial fluid before use. The material of the reservoir is TPE. RWD recommends you use RWD chemical compatibility kits to ensure the compatibility between the solution and the reservoir of RWD Osmotic Pump under following circumstances.
When the solution is in a free alkali state.
When the solution is react with various polymeric materials.

5) RWD osmotic pumps must be filled with solutions completely. Filling volumes should be also recorded. (Refer to **6-Fill**)

6) **Do not wipe the osmotic pump with alcohol and do not soak it in 70% isopropanol.**
Follow the standard sterilization operation when filling and implanting pumps. Wear sterile gloves during the filling and implanting. If gloves are sterilized with alcohol, wait a period until the alcohol evaporates. (Refer to **6-Fill** and **7-Implantation**)

7) **RWD osmotic pumps should be removed at the day of expiration of the duration after implantation.** If not, the attraction of fluid continuously may lead to the pump swelling and leaking highly-concentrated saline solutions, resulting in tissue irritation around the pump.

8) RWD osmotic pumps can deliver solutions into the venous, gallbladder, peritoneal or specific encephalic region, etc. According to the target location, RWD Osmotic Pump Kit can be chosen. (Refer to **RWD Osmotic Pump Kit User Manual**).

5-Choose Flow Moderator

RWD osmotic pumps provide a variety of flow moderators for various application. The following principles should be followed when choosing:

1) For delivery in situ of 200 µl models and 2 ML models. After the flow moderator is inserted into the osmotic pump, a cap should be used to cover the exposed stainless steel tube of the flow moderator to prevent the stainless steel tube from scratching the animal tissue.
2) For ectopic delivery of 200 µl models and 2 ML models. The flow moderator should be connected to a catheter before it is inserted into the osmotic pump (Refer to **RWD Osmotic Pump Kit User Manual** for details). A cap is not required.
3) For delivery in situ of 100 µl models. After the flow moderator is inserted into the osmotic pump, it is directly implanted into the target location.
4) For ectopic delivery of 100 µl models. The stainless steel tube should be connected to a catheter before it is inserted into the osmotic pump (Refer to **RWD Osmotic Pump Kit User Manual** for details). The flow moderator is not required.

6-Fill

Note!

- The solutions should be at the room temperature (23°C) during filling.
- If there is a large quantity of sebum accumulating on the surface of the pump, gloves should be worn to wipe it. Otherwise it may interfere with the performance.

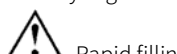
1) Weigh the empty pump together with its flow moderator and record the weight.
2) RWD recommends that a small syringe (1.0 ml or 5.0 ml) and the 27 gauge filling tube should be used to fill the pump. Suck the solution into the syringe and then attach the filling tube. The syringe and filling tube must be free of air bubbles.

Note!

- Air bubbles cannot exist in the pump. The flow moderator must be inserted into the pump during filling. Otherwise, the pumping rate may be nonuniform.
- Using a larger syringe may lead to rapid filling and air bubbles in the reservoir.

- If encountering pressure during filling, slightly cock the filling tube at the angle. Or, the flow moderator can be inserted and removed for several times before connecting the filling tube.

3) Hold the pump vertically and insert the filling tube from the outlet at the top of the pump until it touches the bottom of the reservoir. Then lift up the filling tube about 1 mm slightly.
4) Slowly push the plunger of the syringe and fill the solution into the pump (always vertical). When solutions appears at the outlet, stop filling and carefully remove the syring and the filling tube.



Rapid filling can lead to air bubbles in the reservoir.

5) Wipe off the spilled solution and insert the flow moderator into the pump until the white flange is flush with the top of the pump. Some solutions will be spilled from the filled pump due to inserting the flow moderator. Wipe off the spilled solution.
6) Weigh the filled pump together with the flow moderator. Calculate the difference of the two weights, obtaining the net weight of the filled solutions. The filling weight should be over 90% of the reservoir volume.

For a majority of solutions, the filling weight (mg) should be approximately equals the reservoir volume (μl). If the filling weight approximately equals the reservoir volume, the pump can be implanted. If the filling weight is less than the reservoir volume, there may be air bubbles trapped in the pump. Evacuate the pump and refill.

7-Implant

Experimental animals for subcutaneous implantation weigh at least 10 grams. For intraperitoneal implantation, at least 20 grams.

Subcutaneous implantation steps as follows.

1) Make a small incision in the skin between the scapulae.
2) Then use a hemostat to spread subcutaneous connective tissue apart and create a pocket.
3) Insert the pump into the pocket with the flow moderator pointing to the inside.
4) Use a wound clip or sutures to close the skin incision.

Intraperitoneal implantation steps as follows.

1) Make a small incision in the midline skin below the rib cage of the animal. Make a small incision in the abdominal muscle downwards.
2) Insert the pump into the peritoneal cavity with the flow moderator pointing to the inside.

3) Use sutures to close the muscle incision. Use sutures or a wound clip to close the skin incision.

Note!

- The flow moderator cannot point to the incision when implanting.
- At the initial stage of the pump, there is a possibility of nonuniform pumping rate. If you have strict requirements for uniformity, RWD suggests you submerse the pump.
- The pump must be submersed when the solution is visvous or connected with a catheter.

Incubation method: submerse the pumps in 0.9% saline at 37°C for some hours before implantation. The submersed duration of each specification is shown in table below.

Specification	1003D	1001W	1002W	1004W
Submersed Duration/h	6~8	16~18	16~18	40~44
Specification	2003D	2001W	2002W	2004W
Submersed Duration/h	6~8	16~18	16~18	40~44
Specification	2ML1W	2ML2W	2ML4W	
Submersed Duration/h	16~18	40~44	60~68	

8-Availability

RWD recommends two methods to verify the pump delivering continuously and uniformly.

1) Compare the average pumping rate with the pumping rate on the nominal performance.
2) Test directly in vitro.

Determination of average pumping rate is as follows.

The reservoir volume of RWD Osmotic Pump is slightly larger than that required for completely filling. As a result, there are some residual solutions in the reservoir.

1) Use the filling tube and a 1.0 ml syringe to aspirate the solution from the pump, flushing the reservoir with additional solvent.
2) Analyze the solution recovering from the reservoir and calculate the weight of the residual solution using an appropriate technique.

Calculation of average pumping rate is as follows.

Average pumping rate = (filling weight – residual weight) / Durations

The filling weight should be approximately equals the reservoir volume.

RWD Life Science

Web: www.rwdstco.com
Add: 850 New Burton Road, Suite 201, Dover, DE 19904, Kent, Delaware, USA
Add: 19/20F, Building 9A, Vanke Cloud City III, Liuxin 4 Street, Nanshan District, Shenzhen518000, Guangdong, P.R. China
Tel: +001-858-900-6602 ; +86-755-86111286
After-sales Service: +86-755-86111281
After-sales E-mail: service@rwdstco.com