



WORLD  
PRECISION  
INSTRUMENTS

# INSTRUCTION MANUAL

## NanoFil™

*Microsyringe for nanoliter injection*

Serial No. \_\_\_\_\_

[www.wpiinc.com](http://www.wpiinc.com)

092921



## CONTENTS

ABOUT THIS MANUAL .....	1
INTRODUCTION .....	1
Unpacking .....	2
INSTRUMENT DESCRIPTION .....	3
Choosing the Right Needle—Beveled or Blunt? .....	3
Needle Size .....	3
OPERATING INSTRUCTIONS.....	5
Installing or Changing the Needle.....	5
Filling the NanoFil Syringe .....	6
Using the Syringe With RPE and IO Injection Kit .....	7
Application .....	9
Cleaning the System.....	9
Cleaning NanoFil Needles (304 stainless steel).....	10
TROUBLESHOOTING .....	11
ACCESSORIES.....	12
Recommended Accessories.....	12
Replacement Parts .....	12
WARRANTY .....	15
Claims and Returns .....	15
Repairs.....	15

*Copyright © 2021 by World Precision Instruments. All rights reserved. No part of this publication may be reproduced or translated into any language, in any form, without prior written permission of World Precision Instruments, Inc.*



## ABOUT THIS MANUAL

The following symbols are used in this guide:



This symbol indicates a **CAUTION**. Cautions warn against actions that can cause damage to equipment. Please read these carefully.



This symbol indicates a **WARNING**. Warnings alert you to actions that can cause personal injury or pose a physical threat. Please read these carefully.

NOTES and TIPS contain helpful information.



Fig. 1—The NanoFil syringe is available in two sizes, 10  $\mu\text{L}$  and 100  $\mu\text{L}$ .

## INTRODUCTION

**NanoFil™** is a unique 10  $\mu\text{L}$  syringe developed in response to customer requests for improved microinjection in mice and other small animals. It makes quantitative nanoliter injection much easier and more accurate than any other method currently in use.

**NANOFIL-100** is a 100  $\mu\text{L}$  **NanoFil** syringe. All the needles for the original 10  $\mu\text{L}$  **NanoFil** can also be used with this syringe. The large volume of the syringe is useful for applications that require multiple injections. The speed of the flow at the needle can also be 10 times faster than the 10  $\mu\text{L}$  **NanoFil** when used with **UMP3** UltraMicroPump. The limitation of the 100  $\mu\text{L}$  syringe is that the injection volume resolution is lower than that of the 10  $\mu\text{L}$  syringe.

The design reduces the needle size and dead volume of the system. The smallest metal needle offered for **NanoFil** is our 36 gauge OD (110 mm long) stainless steel needle. This needle is so small it can be inserted into the opening of a 33 gauge needle, previously the smallest gauge available from any micro syringe manufacturer. Offered in both blunt and beveled styles, the needle will cause less damage to the tissue than other micro syringes on the market. In applications where a 36 gauge needle may be too small, slightly larger gauges are also available. The full range includes 33, 34 and 35 gauge needles in both blunt and beveled styles.

In traditional nanoliter injection, the dead volume of the syringe and needle is backfilled with oil as a transfer medium. This makes the process messy and risks contamination of the injected sample. **NanoFil's** low-volume, flexible tubing eliminates the need for oil. Injection is now simpler and less messy, and there is no possibility of oil contamination in critical applications such as ophthalmology research. See the Retinal Pigment Epithelial (RPE) and Intra Ocular (IO) injection kits listed below.

Based on application requirements, **NanoFil** can be used in several different configurations:

- 
- Installed on WPI's **UMP3** UltraMicroPump: This combination allows nanoliter resolution and reproducibility. For neural system injection, mount the **UMP3** on a stereotaxic frame.
  - **SilFlex** tubing and holder: The needle is mounted on a small plastic holder that is connected to the **NanoFil** by a 35 cm length of flexible tubing. The **NanoFil** is mounted on the **UMP3** pump. This configuration allows you to hold the animal in one hand and insert the needle with the other. When the needle reaches the desired location, activate the pump using the foot switch and the pre-programmed injection volume will be injected. This configuration gives a nanoliter level of accuracy and reproducibility. It is best suited for applications such as the RPE and IO injection.
  - Direct injection by hand: This is the simplest and most economical way to inject. Any of the needles can be inserted directly into the **NanoFil** syringe. The limitation of this method is the difficulty in achieving sub-microliter resolution.

## Unpacking

Upon receipt of this instrument, make a thorough inspection of the contents and check for possible damage. Missing cartons or obvious damage to cartons should be noted on the delivery receipt before signing. Concealed damage should be reported at once to the carrier and an inspection requested. Please read the section entitled "Claims and Returns" on page 15 of this manual. Please contact WPI Customer Service if any parts are missing at 941.371.1003 or [customerservice@wpiinc.com](mailto:customerservice@wpiinc.com).

**Returns:** Do not return any goods to WPI without obtaining prior approval (RMA # required) and instructions from WPI's Returns Department. Goods returned (unauthorized) by collect freight may be refused. If a return shipment is necessary, use the original container, if possible. If the original container is not available, use a suitable substitute that is rigid and of adequate size. Wrap the instrument in paper or plastic surrounded with at least 100 mm (4") of shock absorbing material. For further details, please read the section entitled "Claims and Returns" on page 15 of this manual.

## INSTRUMENT DESCRIPTION

### Choosing the Right Needle—Beveled or Blunt?

The replaceable needles used with the **NanoFil** are available with either blunt or beveled needles. The blunt needle is used for injection into soft tissue and when a uniform solution distribution is needed. The beveled style is used for applications that involve the penetration of tough tissue.

One of the main factors that limit the resolution and accuracy of conventional micro syringes is diffusion from the large ID needle. When the needle ID is equal or larger than 100  $\mu\text{m}$ , the error caused by tip diffusion is in the nanoliter range level ( $[100 \mu\text{m}]^3 = 1 \text{ nL}$ ). With a 36 gauge needle installed on the **NanoFil**, the error caused by diffusion is reduced to the sub-nanoliter level, making accurate injection of a nanoliter possible.

All of WPI's beveled needles have a unique 25° tri-surface bevel that is optimized for microinjection. A 10° single-surface beveled needle penetrates better than one with a 25° angle, however the distance between the upper opening to the needle (see dimension F in Figure 1) is longer. As a result, it requires a deeper penetration of the needle to achieve the same level of liquid delivery. Deeper penetration means more tissue damage. WPI's unique 25° tri-surface bevel needle solves this problem with two extra beveled surfaces. The needle of a single surface beveled needle is actually a blade instead of a point. It dulls very quickly. In contrast, the tri-surfaced needle has a real point. It not only penetrates much better but is also much more durable. Tests show that WPI's 33 gauge, 25° beveled needle penetrates easier and lasts longer than other manufacturers' 33 gauge, 10° single-beveled needles. With a 35 gauge tri-surface beveled needle, the resistance to the penetration becomes even less. Each WPI needle undergoes a penetration test before leaving the factory to guarantee the best results.

### Needle Size

**36 gauge:** This is the smallest needle available — so small that it can be inserted into the lumen of a 33 gauge needle tip. There are some limitations to consider before using it. The small diameter makes it necessary to limit length to 2.5–3.0 mm in order to maintain a usable strength. Since the needle ID is in the 25 to 50  $\mu\text{m}$  range, it is easily clogged. Therefore, only well-filtered solutions can be used. Depending on the viscosity of the sample, you might also need to pre-load the syringe with a regular needle before switching to this needle for injection. We recommend using the 35 gauge needle instead of the 36 gauge unless experimental design requires the finer needle.

**35 gauge:** With its balanced combination of strength, length, durability and clog resistance, this was the most popular and preferred needle of most scientists during NanoFil's field trial. It is much smaller than the 33 gauge needle and only slightly larger than the 36 gauge needle, and is much stronger and less likely to clog. Samples can be directly loaded with this needle. Its 5 mm length is sufficient for almost all injection applications in mice.

**34 gauge:** This is a transitional size between the 33 gauge and 35 gauge. If the 35 gauge is too weak and the 33 gauge is too large, 34 gauge is a good alternative.

**33 gauge:** This needle is similar to Hamilton's 7762 and 7803 series removable

---

needles in both needle length and outside diameter. However, WPI's beveled needle version is shorter, more durable, and penetrates better due to the special tri-surface grinding technique. In the past, 33 gauge needles were the smallest size sold and were frequently cited in literature. However, our new 35 gauge needle is much better for injections involving small animals, especially mice. Compared with Hamilton's 33 gauge, 10° beveled needle, WPI's 35 gauge 25° beveled needle can reduce the depth of penetration by almost 80%. The distance between the needle and the upper rim of the opening (dimension F on Figure 1) is ~348  $\mu\text{m}$  for the 33 gauge needle. On the 35 gauge needle, the distance is only 204  $\mu\text{m}$ . In addition, the smaller needle size significantly reduces the required penetration force. In nearly all applications, a 33 gauge needle can be replaced with WPI's 35 gauge needle and produce better results.

**Flexible Quartz Tubing:** The flexible quartz tubing tip is made of 160  $\mu\text{m}$  OD polyimide coated quartz tubing with a special adapter sleeve mounted at the end. It is designed for filling glass capillary electrodes or pipettes, just like WPI's traditional **MF34G** MicroFil. However, unlike the traditional MicroFil which has about 50  $\mu\text{L}$  of dead volume in its luer hub, the dead volume of this needle is less than 0.4  $\mu\text{L}$ . It is useful for loading electrodes with solutions that have a limited volume or are too expensive to waste. The detailed dimension of each needle can be seen in Fig. 2.

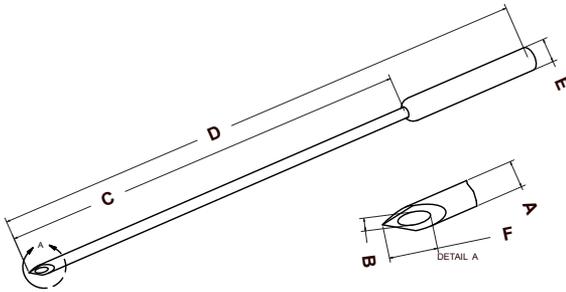


Fig. 2-Needle dimensions

Needle Order Number	Gauge	Needle O.D. A (µm)	Avg. Needle I.D. B (µm)	Range of ID for B (µm)*	Range of OD for B (µm)*	Needle Length C (mm)	Total Length D (mm)	Shank O.D. E (µm)	Bevel Length F (µm)	Total Dead Volume (µL)	Dead Volume Range (µL)	Needle Material
NF33BV-2	33	210	115	89-125	200-216	10	40	460	≈348	0.416	0.2488–0.4909	Stainless Steel
NF34BV-2	34	185	85	64-100	178-190	5	35	460	≈290	0.199	0.1126–0.2749	Stainless Steel
NF35BV-2	35	135	55	38-76	127-139	5	35	460	≈204	0.435	0.3676–0.4608	Stainless Steel
NF36BV-2	36	110	35	25-75	102-132	3	33	460	≈156	0.340	0.2635–0.3671	Stainless Steel
NFQ34-5	34	160	100			55	75	460	n/a	0.589		Quartz
NF33BL-2	33	210	115	89-125	200-216	10	40	460	≈0	0.416	0.2488–0.4909	Stainless Steel
NF34BL-2	34	185	85	64-100	178-190	5	35	460	≈0	0.199	0.1126–0.2759	Stainless Steel
NF35BL-2	35	135	55	38-76	127-139	5	35	460	≈0	0.435	0.3676–0.4608	Stainless Steel
NF36BL-2	36	110	35	25-75	102-132	3	33	460	≈0	0.340	0.2635–0.3671	Stainless Steel
<b>Silflex Tubing</b>			100				35 cm			2.749		
NF26BV-2	26	460	140				40	460		0.380		

\*Needle tolerances are limitations of the material's manufacturer.

# OPERATING INSTRUCTIONS

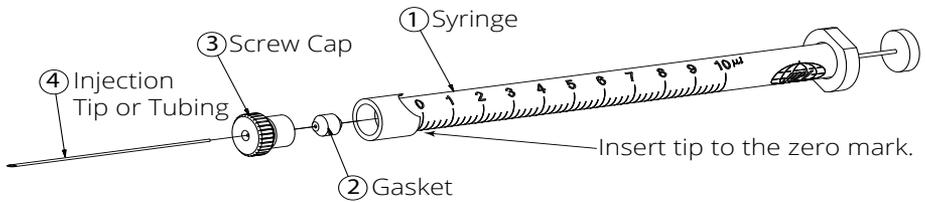


Fig. 3-NanoFil syringe



**CAUTION:** Please note that the syringe should only be operated when the barrel is wet. Otherwise, friction can damage the Teflon® needle of the plunger. Do not pull the plunger repeatedly when the barrel is dry.



**WARNING:** WHEN THE NEEDLE IS CLOGGED, THE PLUNGER CAN GENERATE A VERY HIGH PRESSURE EXCEEDING 10,000 PSI DUE TO THE SMALL CROSS SECTIONAL AREA OF THE PISTON. THE GASKET IN THE SYRINGE WILL NOT BE ABLE TO HOLD THE NEEDLE IN POSITION UNDER SUCH A HIGH PRESSURE, SO IT MAY MOVE OR SHOOT OUT LIKE A BULLET. THEREFORE, **NEVER POINT THE SYRINGE NEEDLE AT A PERSON, AND ALWAYS USE PROTECTIVE GLASSES WHEN USING THE VERY SMALL NEEDLE.**

## Installing or Changing the Needle

The **NanoFil** syringe system utilizes a seal system that is based on a 0.46 mm shank diameter. Any needle or tubing with an outside diameter of 0.46 mm should fit the **NanoFil**'s seal system.

To prevent damage to the gasket and to have the straightest needles, use this method to assemble your needle and syringe.

1. To change or install a needle, loosen the screw cap by turning it counterclockwise to release the compression of the seal. If there is a needle in place it should be easy to pull it out.
2. Remove the screw cap and the gasket from the syringe.
3. Install the replacement needle by pushing the shank of the needle (4) into the open hole in the screw cap (3).

**TIP:** The thick part of the needle shank that goes into the gasket should be cleaned with alcohol to remove any oils left behind by handling and prevent the needle from slipping or moving, residual lubricants left behind can allow the needle to slip or move from the zero set position. The use of surgical gloves is recommended.

4. Place the gasket (2) on the needle.
5. Push the gasket up into the screw cap.

- Place the needle into the syringe body and align it to the zero mark.

**TIP:** Push the needle in far enough to observe the shank through the glass syringe body. In general, the needle should be pushed in until the end of the shank is positioned at the zero mark on the scale. Going beyond this position will not damage the syringe or the needle, but it will prevent the plunger from being able to travel down to the zero mark.

- Once the shank is in the desired position, tighten the screw cap by hand finger tight. Then test the security of the seal by pulling on the needle. It should not come out easily.

## Filling the NanoFil Syringe

There are two different methods for filling the **NanoFil** syringe with fluid.

**The vacuum method** is the standard method used. It involves front filling the syringe via the needle tip using vacuum created by withdrawing the plunger. With this method, the tip of the needle is submerged into a reservoir of fluid while the plunger is withdrawn. This method does not work well for the 36 gauge needle, because the ID of the needle is so small that very little liquid can be taken up. Additionally, this method inherently introduces an air gap at the plunger end of the barrel due to the dead volume of air that exists in the needle prior to pulling fluid into the syringe. This air gap is practically impossible to remove, and the compressibility of air may have an undesirable effect on injection dynamics for certain applications. However, this method has the advantage of being an expedient way to fill the syringe, while exposure and handling of the fluid is kept to a minimum.



*Fig. 4–Vacuum filling of the syringe leaves an air gap.*

**The pre-load method** is useful when working with higher viscosity fluids. A second, larger-volume syringe equipped with WPI's **MicroFil** tubing is used to fill the smaller lumen of the **NanoFil**. The **NanoFil** is loaded from the front with the screw cap, gasket and needle removed. Withdraw the **NanoFil** plunger to the desired volume. Insert the **MicroFil** tubing into the lumen of the **NanoFil** syringe until it is in contact with the plunger. Inject fluid slowly from the loading syringe into the **NanoFil** lumen, and gradually withdraw it as filling occurs. This filling method does not leave an air gap at the **NanoFil** plunger.



Fig. 5–Pre-load method of syringe filling.

**TIP:** A video demonstration of filling the NanoFil can be found on WPI’s website: <http://www.wpiinc.com/blog/2013/05/22/videos/front-filling-nanofil-syringe/>

## Using the Syringe With RPE and IO Injection Kit

These kits are specially designed for “hands-free” and oil-free submicroliter injection. Originally developed for retinal pigment epithelium and intraocular injection, they can also be used for other applications. The injection volume is controlled by **UMP3**’s program and is activated by a foot switch. The “free hands” can be used to hold the animal and place the needle into the injection site. These kits need to be used with a **NanoFil** syringe and **UMP3** to achieve accurate, repetitive and oil-free injection in the submicroliter range. Each kit includes two pieces of **SilFlex** tubing (one for a spare), a needle holder, spare gaskets, and an assortment of four needles — blunt for the RPE kit and tri-surface beveled needles for the IO Kit. Each kit comes with one each of 33, 34, 35 and 36 gauge needles so that first time users can find the best size for their application.

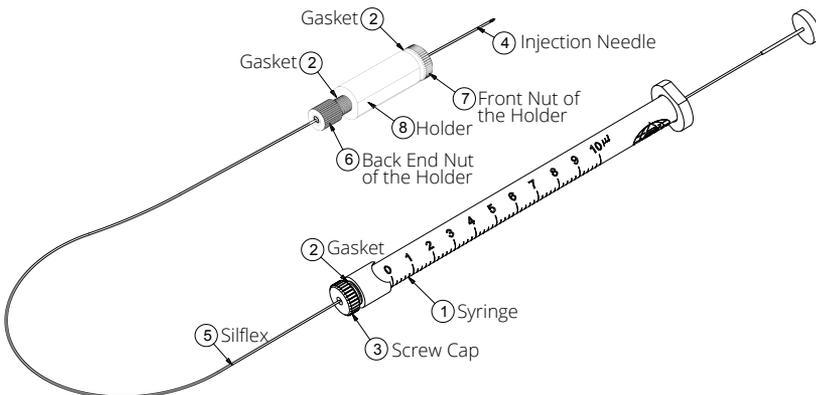


Fig. 6–NanoFil syringe with the RPE Injection Kit.

- **SilFlex** (flexible and low dead volume tubing). This tubing is made of 100  $\mu\text{m}$  ID quartz tubing with a Teflon jacket making it a total 460  $\mu\text{m}$  OD. It is 350 mm long and the dead volume of the tubing section is about 3  $\mu\text{L}$ . The low dead volume, consistent inside diameter and flexibility are essential for the system. Special attention is needed when handling this tubing.



**CAUTION:** Sharp bending can crack the glass and damage the tubing permanently. Do not bend it with a radius less than 30 mm or against a sharp corner.

The tubing needs to be flushed with distilled water after use. Due to its small inside diameter, the tubing can become clogged with particles or proteins in solution. If clogged, flushing it from the opposite end of the tubing with a syringe might dislodge the particle. Load cleaning solution into the **NanoFil** syringe with the 26 gauge needle provided. Remove the 26 gauge needle and insert the **SilFlex** tubing with the opposite end coupled to the chosen needle. Force the cleaning solution out. An ultrasonic bath might also help to loosen particles in the tubing.

- **Needle holder nuts** ⑥ ⑦. The holder connects the **SilFlex** tubing with the injection needle. It has the same coupling mechanism used on the **NanoFil** syringe. The inside diameter of the barrel and gaskets are identical to the one on the syringe. Both needle and tubing should be installed by loosening the screw, inserting the tubing and tightening the nut finger-tight. The **SilFlex** is inserted through the red nut ⑥ on the back of the holder. Insert your needle of choice through the front cap ⑦. The length of the needle can be adjusted by sliding the needle up into the holder. The needle and **SilFlex** should be very close to each other inside the holder barrel, but not touching. Because the tubing will move forward as the screw is tightened, a gap between the needle and the tubing is essential to avoid crushing the tubing. The gap can be as large as 1 mm while only increasing dead volume by 0.17µL. Because the **SilFlex** tubing is very soft, it might be difficult to “fish” it through the gasket during the installation. To solve this problem, unscrew the red nut and use forceps to take out the silicone gasket. Thread the nut and the gasket onto the **SilFlex** tubing. Then, with the red nut and gasket on, fit the **SilFlex** into the back hole of the holder ⑧. Using one hand to hold the **SilFlex** in the holder, slide the gasket and red nut into the holder and tighten it.
- **Gasket.** The gasket is yellow, and it has both a narrow and a wide opening to make the needle insertion easier.

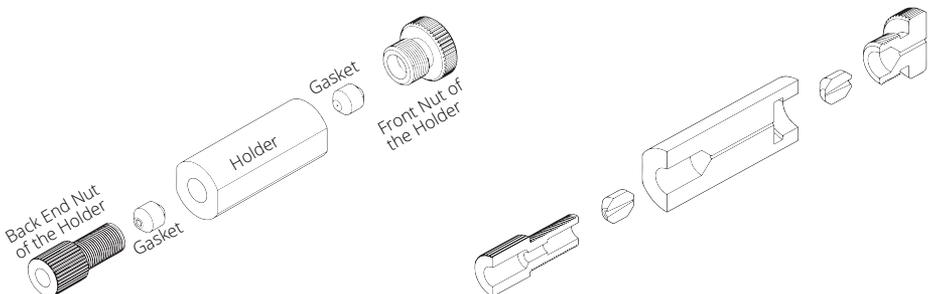


Fig. 5—The NFINHLD holder has a gasket at each end with a narrow opening. As shown in the cutaway view, the wide opening of the gasket faces the end nuts, and the narrow opening of the gasket points toward the holder.

- **Injection needle.** Any needle that can be used directly on the **NanoFil** syringe can also be used with the pipette holder and is installed in exactly the same way.

---

## Application

Assemble the **SilFlex**, tubing, needle holder and needle first without mounting the **SilFlex** into the **NanoFil** syringe. When the **SilFlex** is dry, the air trapped in the tubing will prevent it from being filled like a regular needle. The dead volume of the **SilFlex** is about 2.7  $\mu\text{L}$ . Therefore, the syringe needs to be pre-filled with a regular needle with more than 3  $\mu\text{L}$  of fluid before installing the **SilFlex** on to the **NanoFil**. (After the first injection is finished, the syringe can be filled directly from its needle, because the tubing will be filled with solution at that time.)

After filling the system, install the **SilFlex** and needle holder assembly and mount it on the **UMP3** UltraMicroPump. Advance the plunger until a small amount of liquid comes out of the needle. The system is now ready for injection. Program **UMP3's** controller for the volume to be injected. Use one hand to hold the animal and the other hand to place the needle into the injection site. Then use the foot switch to activate the pump for injecting a controlled amount of solution.

The **NanoFil** syringe is 60 mm x 10  $\mu\text{L}$  (or 100  $\mu\text{L}$ ) and has an inside diameter of 0.46 mm (or 1.46 mm). When using a **MICRO2T SMARTouch™** controller:

- For **NANOFIL**, select the Type 5 syringe type.
- For **NANOFIL-100**, select the Type 8 syringe type.

If you are using a **Micro4** controller with your pump, the syringe type you choose will depend on the firmware version of your **Micro4** controller.

Micro4 Revision	60 mm x 10 $\mu\text{L}$ Syringe Type	60 mm x 100 $\mu\text{L}$ Syringe Type
H	M	G
J	L	G
K.3	L	G

**TIP:** **Micro4** units display the version on power up. To identify the version of older **Micro4** controllers, first look for a firmware label. If a label is not found, program the **Micro4** for syringe Type L and enter a value of 170 nL /sec. If the number displayed automatically switches to **169** then your unit is Rev. H. (Use syringe Type M and the setting of 0.5293 for the entry.) If the number remains **170**, the controller is Rev. J. (Use syringe Type L.)

## Cleaning the System

When dried, protein or other high molecular weight reagents inside the syringe can clog the system. Saline solutions in the stainless needle can cause corrosion of the needle if not rinsed out, so it is important to rinse and dry the syringe and needle after each use. (A drying cabinet is recommended.) The entire system is made of materials that are resistant to most organic solutions. It can be cleaned using any organic solvent or chemical sterilization.



**CAUTION:** Autoclaving the **NanoFil** syringe is not recommended, since the adhesives and the Teflon seal will eventually breakdown or swell from the heat and pressures involved. The most practical method of sterilizing is either ethylene oxide (EtO) gas or Rapidcide OPA/28 (WPI # **504611**) liquid chemical

sterilization.

---



**CAUTION:** Chemicals that should be avoided include:

- Hydrofluoric acid (HF) damages the glass and quartz.
- Strong acid damages the stainless needle and plunger.

**TIP:** If you are using multiple syringes, take care to avoid mixing plungers and bodies when disassembling for cleaning. *Plungers and syringe bodies are not interchangeable.* Each plunger has been individually selected to fit the tight tolerances of each syringe body. Because of this, replacement plungers are not available; if a plunger tip breaks, the entire syringe must be replaced.

1. Remove the plunger, the front gasket nut and the gasket. Soak those items by themselves.
2. Use a small volume plastic syringe to inject Rapicide into the NanoFil syringe body from the front or the back. Soak that in a dish where the whole body is submerged.
3. After following the treatment on the label, rinse the items thoroughly in distilled water.
4. After wetting the tip, carefully replace the Teflon tipped plunger. If the tip is not wet, it may break off.

## Cleaning NanoFil Needles (304 stainless steel)

**TIP:** Use caution when cleaning the needles, because the smaller ones can rust on the inside.

**Enzymatic Cleaners**—Immediately after using the **NanoFil** needles, flush them out with soap or enzymatic cleaner (like Enzol or Tergazyme) and rinse with distilled water. Follow this with 95% alcohol, and then dry it with compressed dry air (or nitrogen).

**Ultrasonic Cleaners**—If desired, you may use an ultrasonic cleaner with hot detergents. Avoid using strong acids, chlorinated compounds or strong corrosives that are detrimental to stainless steel 304.

**Autoclave**—**NanoFil** needles may be autoclaved (wet, 121°C) a number of times. Be sure to Dry them inside and out after sterilization.

Store **NanoFil** needles dry. The best storage is in a desiccant cabinet with a drying agent like calcium chloride. Do not store these needles in water or leave them soaking in an aqueous solution.

## TROUBLESHOOTING

Issue	Possible Cause	Solution
After the syringe has been stored for a period of time, the syringe will not pick up the solution even with the 26 gauge needle.	This is most likely due to leakage in the gasket. After a long period of storage, the gasket could become compressed and lose its sealing ability.	Tighten the nut to compress the gasket.
When using the RPE or IO kit, the solution keeps flowing out of the needle tip after UMP3 pump has stopped pumping.	The most likely cause is a trapped air bubble in the syringe. Because the RPE and IO kits require a high pressure to inject, an air bubble trapped in the system will be compressed during injection. It will expand back to original size after the injection is finished, causing the solution to ooze out of the needle slowly.	Air bubbles <b>MUST</b> be removed before injection. It is especially important for the NANOFIL-100.
The needle is blocked.	Particles getting trapped in the needle. Concentrated salt solutions such as those used in microinjection of this type can form crystals inside the needle or the syringe. This can corrode the needle.	Because of the small inner diameter, most blocked needles are very difficult to recover. However, here are some methods to unblock the needle that might work. Try using an Ultrasonic cleaner to clean the needle for 5 to 10 minutes. This might shake the particles inside the needle loose.
Syringe leaks at the Teflon tip.	The Teflon coating on the plunger tip has shrunk.	Remove the plunger and heat it (80°C max.) with a hot air gun to soften the Teflon coating. When hot, place the tip on a flat surface and press down gently for a few seconds. Allow plunger to cool before wet reassembly.
The needle slips out of the zero position in the syringe or the <b>NFINHLD</b> needle holder.	The gasket is damaged or the needle shank has been contaminated with oils.	Wash the exterior of the needle and gasket interior with alcohol or replace the gasket ( <b>NFGSK-5</b> ).

**NOTE:** If you have a problem/issue with that falls outside the definitions of this troubleshooting section, contact the WPI Technical Support team at 941-371-1003 or [technicalsupport@wpiinc.com](mailto:technicalsupport@wpiinc.com).

## ACCESSORIES

<b>NANOFIL</b>	NanoFil Syringe, 10 microliter
<b>NANOFIL-100</b>	NanoFil Syringe, 100 microliter

NanoFil syringe does not contain any injection needles. Needles must be purchased separately. It does include a 26 gauge beveled needle for backfilling.

## Recommended Accessories

<b>RPE-KIT</b>	Retinal Pigment Epithelium (RPE) Injection Kit: SilFlex tubing, gasket (2), holder, and blunt tipmix (33, 34, 35 and 36 gauge)
<b>IO-KIT</b>	Intraocular (IO) Injection Kit: SilFlex tubing, holder, gasket, and beveled tipmix (33, 34, 35 and 36 gauge)
<b>NF33BL-2</b>	33 gauge blunt NanoFil needle (pkg of 2)
<b>NF34BL-2</b>	34 gauge blunt NanoFil needle (pkg of 2)
<b>NF35BL-2</b>	35 gauge blunt NanoFil needle (pkg of 2)
<b>NF36BL2</b>	36 gauge blunt NanoFil needle (pkg of 2)
<b>NF33BV-2</b>	33 gauge beveled NanoFil needle (pkg of 2)
<b>NF34BV-2</b>	34 gauge beveled NanoFil needle (pkg of 2)
<b>NF35BV-2</b>	35 gauge beveled NanoFil needle (pkg of 2)
<b>NF36BV-2</b>	36 gauge beveled NanoFil needle (pkg of 2)
<b>NF33-36BL</b>	Assortment of 4 blunt NanoFil needles
<b>NF33-36BV</b>	Assortment of 4 beveled NanoFil needles
<b>NFQ34-5</b>	34 gauge Flexible Quartz Tubing for filling (pkg 5)

## Replacement Parts

<b>NFINHLD</b>	NanoFil Injection Holder
<b>SILFLEX-2</b>	SilFlex tubing (pkg of 2)
<b>NFGSK-5</b>	Spare Gasket for NanoFil and Holder (pkg of 5)



## WARRANTY

WPI (World Precision Instruments) warrants to the original purchaser that this equipment, including its components and parts, shall be free from defects in material and workmanship for a period of 90 days\* from the date of receipt. WPI's obligation under this warranty shall be limited to repair or replacement, at WPI's option, of the equipment or defective components or parts upon receipt thereof f.o.b. WPI, Sarasota, Florida U.S.A. Return of a repaired instrument shall be f.o.b. Sarasota.

The above warranty is contingent upon normal usage and does not cover products which have been modified without WPI's approval or which have been subjected to unusual physical or electrical stress or on which the original identification marks have been removed or altered. The above warranty will not apply if adjustment, repair or parts replacement is required because of accident, neglect, misuse, failure of electric power, air conditioning, humidity control, or causes other than normal and ordinary usage.

To the extent that any of its equipment is furnished by a manufacturer other than WPI, the foregoing warranty shall be applicable only to the extent of the warranty furnished by such other manufacturer. This warranty will not apply to appearance terms, such as knobs, handles, dials or the like.

WPI makes no warranty of any kind, express or implied or statutory, including without limitation any warranties of merchantability and/or fitness for a particular purpose. WPI shall not be liable for any damages, whether direct, indirect, special or consequential arising from a failure of this product to operate in the manner desired by the user. WPI shall not be liable for any damage to data or property that may be caused directly or indirectly by use of this product.

## Claims and Returns

Inspect all shipments upon receipt. Missing cartons or obvious damage to cartons should be noted on the delivery receipt before signing. Concealed loss or damage should be reported at once to the carrier and an inspection requested. All claims for shortage or damage must be made within ten (10) days after receipt of shipment. Claims for lost shipments must be made within thirty (30) days of receipt of invoice or other notification of shipment. Please save damaged or pilfered cartons until claim is settled. In some instances, photographic documentation may be required. Some items are time-sensitive; WPI assumes no extended warranty or any liability for use beyond the date specified on the container

Do not return any goods to us without obtaining prior approval and instructions from our Returns Department. Goods returned (unauthorized) by collect freight may be refused. Goods accepted for restocking will be exchanged or credited to your WPI account. Goods returned which were ordered by customers in error are subject to a 25% restocking charge. Equipment which was built as a special order cannot be returned.

## Repairs

Contact our Customer Service Department for assistance in the repair of apparatus. Do not return goods until instructions have been received. Returned items must be securely packed to prevent further damage in transit. The Customer is responsible for paying shipping expenses, including adequate insurance on all items returned for repairs. Identification of the item(s) by model number, name, as well as complete description of the difficulties experienced should be written on the repair purchase order and on a tag attached to the item.

*\* Electrodes, batteries and other consumable parts are warranted for 30 days only from the date on which the customer receives these items.*

**USA**

175 Sarasota Center Blvd., Sarasota FL 34240-9258  
Tel: 941-371-1003 • Fax: 941-377-5428 • E-mail: sales@wpiinc.com

**UK**

1 Hunting Gate, Hitchin, Hertfordshire SG4 0TJ  
Tel: 44 (0)1462 424700 • Fax: 44 (0)1462 424701 • E-mail: wpiuk@wpi-europe.com

**Germany**

Pfingstweide 16, D-61169 Friedberg (Hessen), Germany  
Tel: +49 (0)6031 67708-0 • Fax: +49 (0)6031 67708-80 • E-mail: wpide@wpi-europe.com

**China & Hong Kong**

WPI Shanghai Trading Co., Ltd.  
Rm 27A, Liangfeng Building, No 8, Dongfang Road, Pudong New District, Shanghai, PR China  
Tel: +86 21 6888 5517 • Toll Free: 400 688 5517 • E-mail: chinasales@china.wpiinc.com

**Internet**

www.wpiinc.com • www.wpi-europe.com • www.wpiinc.net