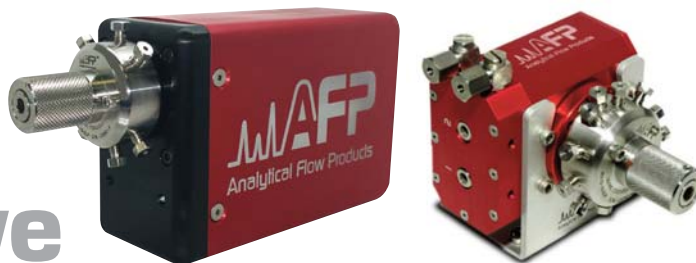




RV Series Rotary Valve



User's Instructions [REV. 0.6]

Your valve has been assembled and tested in a clean environment with the use of high purity gases and instruments. Strict procedures are followed to make sure to delivering a product with the highest level of performances. The rotor and preload assembly have been matched and tuned in order to get the valve inside working specifications with the lowest possible actuation torque. The rotor sealing materials have been treated with a proprietary process.

Please follow carefully the installation and operation instructions. This will make sure to get the maximum performances out of your system. If you have any questions, please don't hesitate to contact Analytical Flow Products.



Please read and understand the instruction related to this product. These are the User's Instructions and the AN-05 application notes.

Failure to do so may result in human injury, death and equipment damage or malfunction.

Recommended reading: For a good tutorial about Rotary Valves for GC, please read the Design Report #2, entitled «Rotary Valves, Then and Now - An Improved Conical Rotary Chromatographic Valve» available from our website.

PRELIMINARY NOTICE

- A** Keep the valve in its original sealed box or wrapped until you are ready to install it.
- B** When unpacking the valve, take all the precautions necessary to avoid the introduction of any particles in any valve ports. Introduction of particles will ruin valve performances and operation. Don't use tape to temporary seal the ports. Glue or a piece of tape may contaminate the valve.

NOTE:

Never install tubing that has been cut with any type of mechanical tube cutter; for example, electrical file or hand rotary tube cutter. Always use pre-cut tubes in critical part of your system.

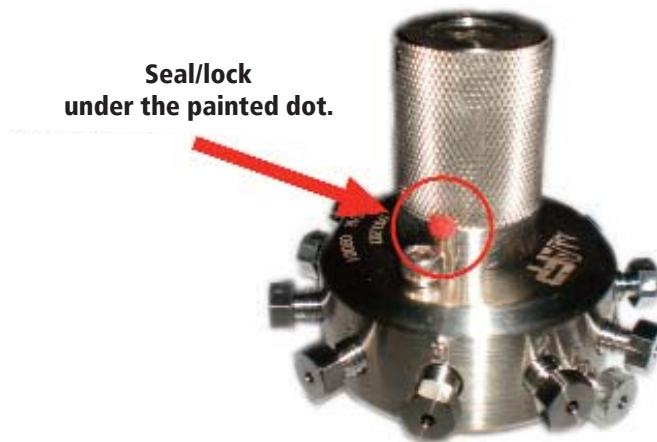
- C** Use the supply hardware to install and operate the valve. Do not use either third party ferrules. This may affect the high level of sealing integrity of your system.
- D** Read and understand the valve specification sheet and adjust valve operating parameters accordingly.
- E** Wear appropriate gloves to manipulate ferrules and tubing ends. Failure to do so will have negative impact on some detector response like FID, ECD and some mass spectrometers. Use clean tools at all time.
- F** Make sure that particle size will be less or equal to 10 μm . Use appropriate gas particle filter for actuation, sample and carrier.

NOTE:

You may also consider ordering your valve with frits pre-installed in valve's port, if your application can work with it. Frits act as particles filters.

Particles pollution, bad tubing cutting procedures and bad manipulation procedures are the major causes of valve failure.

- G** The pre-load assembly should not be unscrewed and rotor should not be removed. The pre-load assembly is sealed. See Fig. 1. **Breaking seals during the warranty period voids the warranty.** However, user may retune the rotor pressure adjusting screw, if the applications require it.

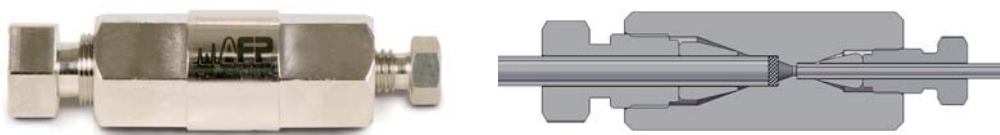


■ Fig. 1: Rotary Valve Sealed, under the red dot.

- H** Keep the valve inside rated operating conditions i.e. temperature and pressure. Operation beyond the maximum specified value will decrease the valve's lifetime and performance.

NOTE:

Pack column, molecular sieves, porous polymer or others have a tendency to release very fine dust over the time. The traditional quartz wool uses to keep packing inside the column are not enough to trap this fine abrasive dust. We recommend the use of low torque, fine pitch thread with internal mounted frit column end fitting. Such fitting will hold in place the packing material while preventing migration of fine dust.



■ Fig. 2: Column End Fitting (Part# URF-081646L2)

Don't forget any particles that are allowed to flow inside rotary valves will degrade quickly its performance and void the warranty. Rotary valves are more sensitive to particles contamination than diaphragm valves. Furthermore, in some cases, fluids may be particle free, but some liquids may precipitate solid under some specific operating conditions. Make sure to avoid such situation.

1.1 ACTUATION MECHANISM

While AFP® rotary valves will work with all available actuator on the market, there is no doubt that a better performance could be achieved with AFP® rotary actuators. Our actuators family, i.e. pneumatic and electric, makes sure that there is only rotational force transferred to the valve, no radial or side load effect. Furthermore, the stroke limiting mechanism makes sure that the valve never becomes overloaded.

Most other actuators don't do that and valve stopper and/or driver pin will become engraved by the overloading action of these commercial actuators. So, the use of our actuator is strongly recommended in order to get the specified performance. Please see our design report DR-2 for more information about these various phenomena.

There are thousands of different compounds out there waiting to go through a valve to be analyzed. Make sure that your sample is compatible with the valve's material wetted parts. If caustic, corrosive, or other aggressive compounds are used, special materials or surface treatments may be required. Please refer to the material compatibility table below. Toxic and dangerous compounds may require special manipulating procedures. Also, be aware that some local regulations may apply to your particular compound. Please verify with your local authority. This may be the case for some radio-active compound.

Furthermore, surface adsorption may affect repeatability of your analytical system, mainly for low level measurements. In such cases, it is recommended to conditioning the valve by operating it at 150°C under clean gas flow. This will evacuate the atmospheric compounds that may have been absorbed into material surface.

NOTE:

Always test the selected valve's configuration in your application to make sure that your system is performing as expected. If not, other valve configuration could be selected. Don't hesitate to contact AFP® for more information on available material and various purging flow path configuration available.

	Gasoline	Strong Acids	Strong Bases	Hydrocarbons	Oxidizing Agents	Alcohols	Ketones	Esters	Steam	Max. Continuous Temperature
AFP® PTFE	E	E	E	E	E	E	E	E	E	200°C
AFP® PEEK	E	F	E	E	F	E	E	E	E	225°C
AFP® Polyimide	F	F	NR	G	NR	E	G	E	NR	260°C*
AFP® PPS	E	G	E	E	G	E	E	E	G	175°C

E : Excellent

G : Good

F : Fair

NR : Not Recommended

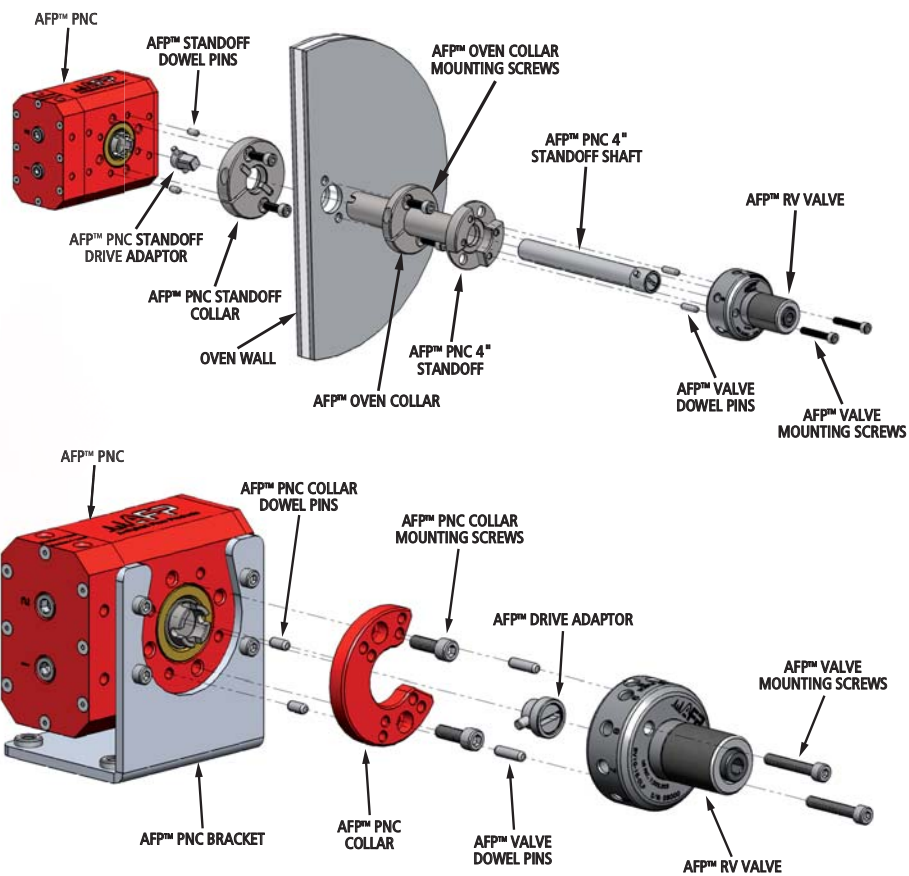
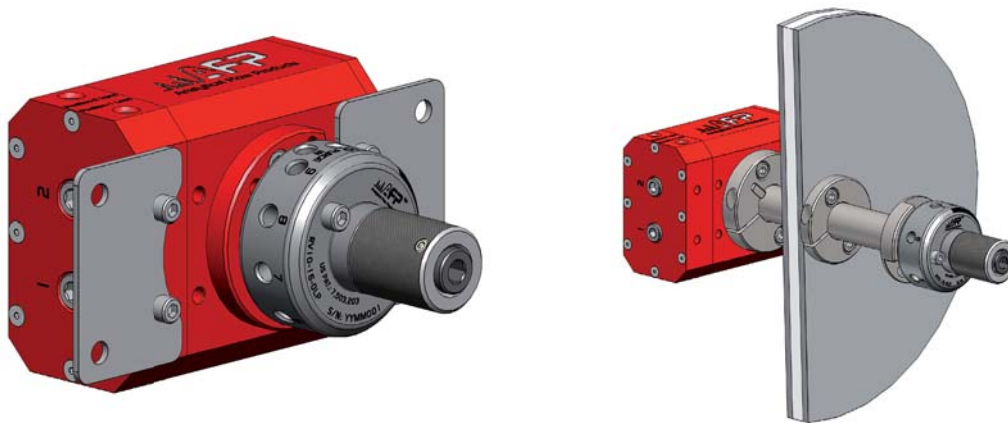
*350°C short exposure

NOTE:

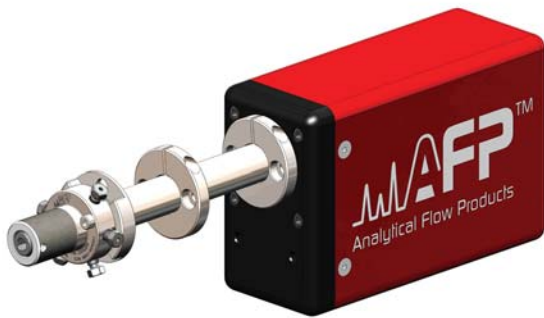
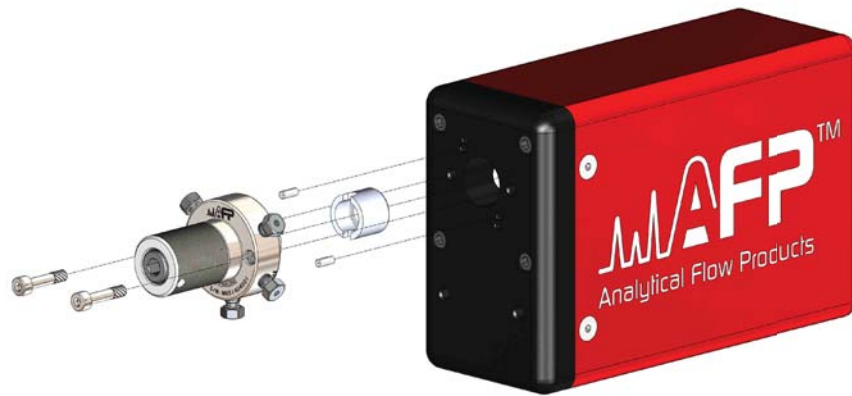
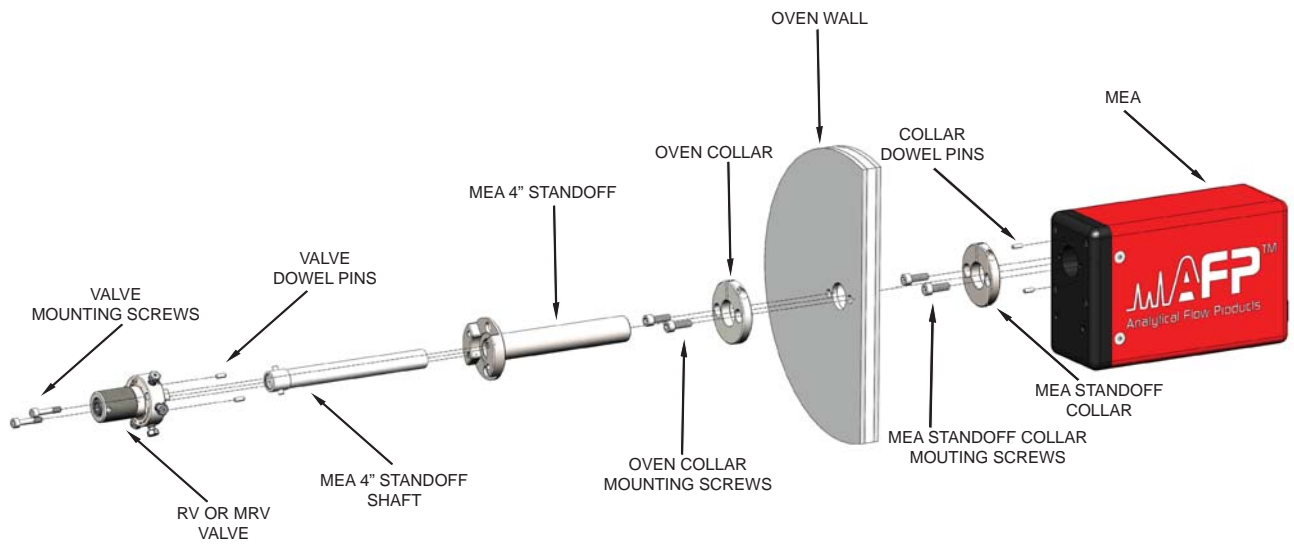
We do recommend installing our rotary valve on our rotary actuator. This assures the achievement of the best performance, otherwise not achievable with third-party actuator. Please see section 2.3 on "How to install AFP® rotary valve on third-party actuator".

2.1

INSTALLING AFP® ROTARY VALVE ON AFP® PNEUMATIC PNC TYPE ACTUATOR



INSTALLING AFP® ROTARY VALVE ON AFP® ELECTRIC MEA TYPE ACTUATOR



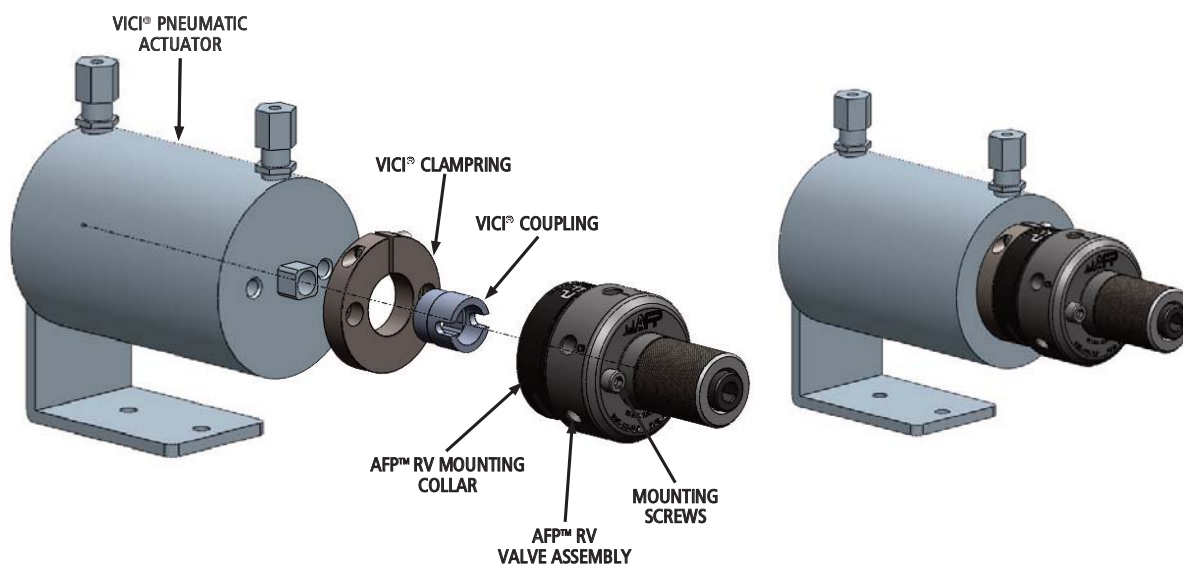
INSTALLING AFP® ROTARY VALVE ON THIRD-PARTY ACTUATOR

The most popular third-party pneumatic actuator is manufactured by VICI® company. This actuator could be used with our rotary valve, but users must be aware that system overall performance will be degraded. Please see Design Report DR-2 for more details on this subject.

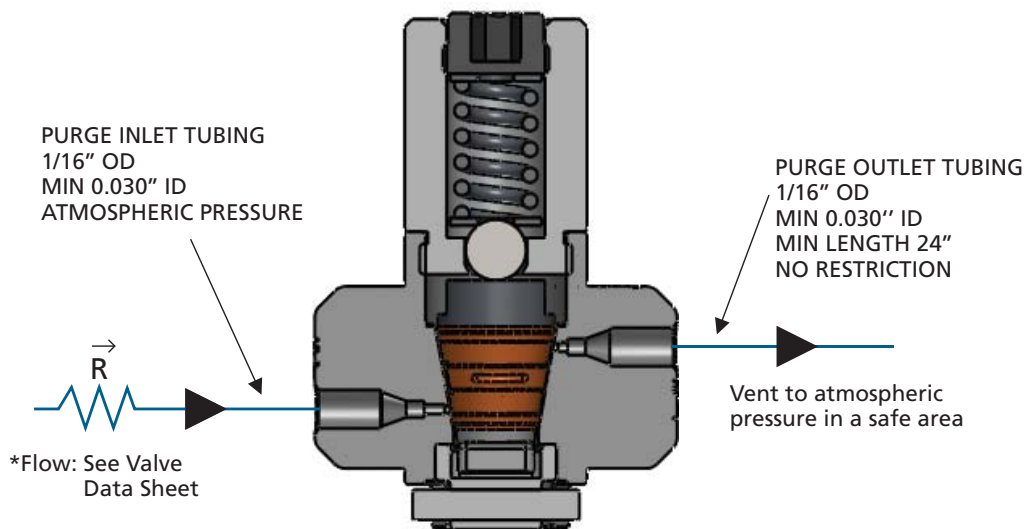
NOTE:

Our adaptor makes sure that valves will not rotate over time when mounted on a VICI® pneumatic actuator. This relieves valve mounting screws from rotary forces, causing common screw twisting.

However, there is no precise stroke or travel limiting adjustment on such actuator. This will result in valve stopper engraving over time. This may also lead to flow restriction, even complete flow interruption. Be aware of this when using third-party actuators.



The patented purge feature of this valve is a very powerful one. It allows very high sensitive applications to be done with complete elimination of atmospheric interferences and cross port leaks. It eliminates diffusion and permeation related problems. It also eliminates the need of a purge enclosure. Safer operations and vacuum sample or GC/MS interface are easier to implement with success. See Fig. 3 for typical installation of the purge.



**Fig. 3: Typical Rotary Valve Purge Tubing Set Up,
Valve internal purging channel at atmospheric pressure and high velocity**

The purging gas is normally supplied to the valve through a simple flow orifice. This orifice can be made of a short piece of 1/16" OD tubing. The tube is generally pinched with the help of pliers in order to let around 5 sccm of gas flow through it. The flow could be measured with a bubble flow meter or any appropriate and accurate gas flow measuring device. The measuring flow device used to tune the orifice must have his outlet vent at atmospheric pressure. This is to make sure that you will know the flow of purge gas into the valve. The purge gas source is dependent of the application. Most of the time, the purge gas is the same as the carrier gas. So, the gas is tee off of the carrier gas inlet and then the flow orifice is tuned at the carrier gas pressure level.

For most applications, having the purge fluid flowing at low pressure and high velocity works very well. Higher velocity helps to evacuate particles generated over time, reducing wearing. High velocity also allows quick evacuation of cross port, inboard and outboard leaks.

Please see application note AN-05 for more information about using purging feature. Also please see warning notice to avoid hazardous situation. If your system is made of several valves with purge, the best is to connect them in parallel. However, if carrier gas supply is a problem, you may connect the valve purging network in series.

Our rotary valve family is different in design and performance from any rotary valve available on the market. So are the maintenance procedures. In its lifetime, the rotor should not require a replacement.

In normal and recommended operating condition, the rotor will last well over the warranty period. However, with time, the rotor wearing will occur leading to leak development. If leak level becomes too high for the application, the rotor pre-load assembly may be re-adjusted in order to reduce leaks.

- 1 First you must make sure that clean gas is flowing into the valve.
- 2 Loose the preload assembly locking screw in order to be able to freely adjust the pressure setting set screw.
- 3 Actuate the valve a few times under clean conditions before proceeding.
- 4 Slowly turn clock wise (CW) the pressure adjusting screw. The pressure adjusting screw has fine pitch threads on it allowing an easy and more precise tuning.
- 5 Turn 1/4 of a turn at the time and re-check for leaks.

NOTE:

Overtightening the pressure setting set screw will damage the rotor and the stator assembly.

- 6 When leak level has come back to an acceptable level, re-tight the preload assembly locking screw. If leak level could not be restored inside the target value, the valve should be removed from the system for cleaning / surfacing / rotor replacement and re-qualification.

We recommend returning the valve to our facility for this process. It could be done rapidly and it is guaranteed that the valve's performance will be like a brand new valve.

NOTE:

AFP® does not recommend rotor replacement in the field since performance will never be equal to a new one. Indeed, most of the time, the stator will have microscopic scratches that can't be seen by naked eyes, even if the surface finish looks well after cleaning it.

However, if a customer wants to replace it anyway, follow the rotor replacement procedures, as described below.

TK-02

Tools required:

- 3/16" Allen key
- 1/16" Allen key
- Channel Lock Pliers
- AFP® Tweezers

Optional tools (to remove the valve from the instrument):

- 7/64" or 9/64" Allen key
- 1/4" wrenches

**NOTE:**

We recommend removing the valve from the instrument for this procedure. This is to ease stator cleaning and to avoid pushing dirt and particles into valve's ports. If you do so, once the valve removed, plug all tubing to limit contamination of the instrument.

WARNING:

Rotor replacement operations must be performed in a clean, well-vented and well-lighted area. Flush away any hazardous or toxic materials from the valve before beginning. Please read all the procedure before starting.

- 1** With the 1/16" Allen key, loose the preload assembly locking screw in order to be able to freely adjust the pressure loading screw that applied force on the spring.
- 2** With the 3/16" Allen key, unscrew the pressure loading screw until loose. This way no more force is applied on the rotor.
- 3** Unscrew the preload assembly. To do so, a channel lock pliers may be required to break the seal. Use light force or a piece of rubber (or any other soft material) between the pliers' jaws and the preload assembly. This is to avoid scratching or marking the preload assembly button.
- 4** Use the special tweezers to pull out the rotor.

WARNING:

Don't allow the rotor to touch the stator surface when removing it.

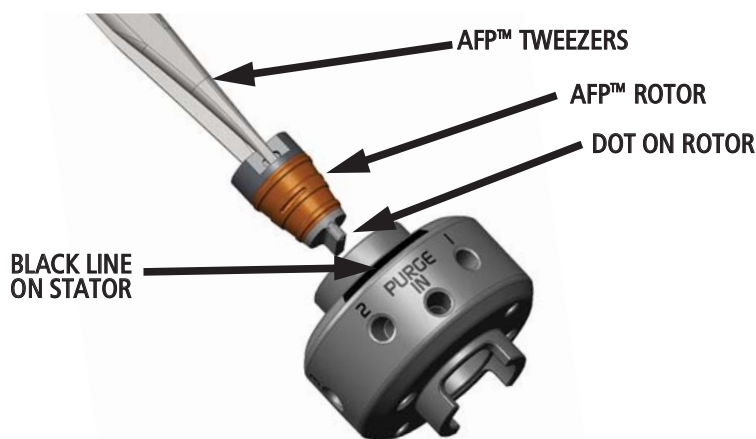
- 5** Put some solvent which is compatible with the instrument (usually isopropyl alcohol) on a lint free swab or wiper. Then, gently clean the internal stator surface where the rotor sits. Make sure to remove any loose particles.
- 6** Make sure that there is no particle in the valve's ports. Use a clean and particle free high pressure gas to clean ports. After this step, clean and dry the stator's surface by blowing it with high pressure clean and particle free gas.
- 7** Visually inspect the freshly cleaned stator surface finish. Use a source of light to have a better view. If there is any scratch on the stator surface, then the valve must be replaced. If there is still dirt on the surface, repeat steps 5 and 6.
- 8** If previously removed, re-install the valve's stator into the instrument.

- 9 By using the AFP® tweezers, remove the new rotor from its shipping package.

WARNING:

During this step, the rotor must not be touched by your fingers. The rotor surface must not be in contact with any other surfaces. Doing so will result in poor valve performances.

Gently and without hitting or touching stator and rotor surface together, introduce the rotor into the stator. While introducing the rotor, align the dot on the tip of the rotor with the «F» of AFP® logo on the stator on older version. On most recent version align it with the black line marked on top of the stator (see figure 4).



■ Fig. 4: Rotor installation

- 10 Re-install the preload assembly. Make sure that previous marks on the stator are aligned with the ones on the preload assembly.
- 11 Actuate the valve a few times under clean conditions before proceeding.
- 12 Slowly turn clock wise (CW) the pressure loading screw. The pressure loading screw has fine pitch threads on it allowing an easy and more precise tuning.
- 13 Turn ¼ of a turn at the time and re-check for leak.

WARNING:

During this step, the rotor must not be touched by your fingers. The rotor surface must not be in contact with any other surfaces. Doing so, will result in poor valve performances.

- 14 When leak level has come back to an acceptable level, re-tight the preload assembly locking screw. If leak level could not be restore inside the target value, the valve should be replaced.