Important System Design Considerations for SAE J1926 Ports

Thursday, May 14, 2020 by TechConnect Team

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Fitting and port dimensions are an exact science. For the design engineers incorporating these fittings into their systems, it may not be obvious what the Critical Dimensions are. Rest assured, the fitting community has meticulously calculated every aspect of the design. The majority of these dimensions are coming from industry standards (some of which have been refined for decades). When you are choosing which fitting to use in your design, there are several considerations you must make to ensure you have all the information you need to design your system properly. *Additionally, it would be helpful to read our complementary post discussing spatial allowance when designing: Spatial Allowance for Fittings in Fluid and Gas Systems.*

In this post, we are outlining a few design considerations when incorporating SAE J1926 into your design. A fitting or port that follows SAE J1926 can go by many names, SAE-ORB, ORB, O-Ring Boss, Boss Stud, and SAE J1926 to name a few. All of these are common names for a hydraulic port connection that is manufactured per SAE J1926. In this post we'll just stick to calling it SAE J1926.

Understanding the SAE J1926 section breakdown

SAE J1926 is split into multiple documents by SAE:

- **SAE J1926-1** details the internal (female) port dimensions. This port is the same for all external (male) studs.
- **SAE J1926-2** details the external port stud for heavy duty designs. This port stud is used primarily on ORFS (O-ring Face Seal) parts per SAE J1453.
- **SAE J1926-3** details the external port stud for light duty designs. This port stud is used on JIC/37-degree flare, flareless bite style, and port adapters parts per SAE J514.
- **SAE J1926-4** details the designs for port plugs specifically. These will not be covered in this post.

Important differences between SAE J1926-2 and SAE J1926–3

There is a visible difference between the stud length of SAE J1926-2 and SAE J1926-3, as seen in Figure 1. This is why it is important to design your port depth based on SAE J1926-1 rather than designing it from the stud length of the fitting. Otherwise, you could end up with an internal port that is too shallow to fully assemble the external stud.

> ***History Lesson:*** *When the SAE port was first developed, it was a part of SAE J514, but it still included the full thread depth, even though ORFS fittings per SAE J1453 were not yet developed. Due to ORFS fittings by nature being higher pressure, it was determined that the stud length needed to be increased so it was designed to utilize the full extent of the SAE port.*

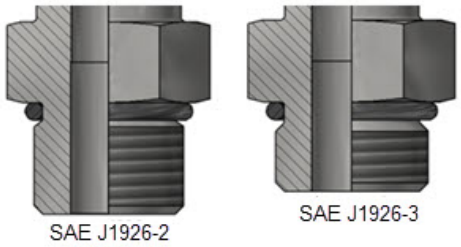

Figure 1. SAE J1926-2 vs. SAE J1926-3

The port in SAE J1926-1 is designed to achieve the highest working pressure capability listed in the standard for each individual size. That high pressure is associated with the corresponding stud in SAE J1926-2 (ORFS). If the threads on the port are designed so that they are shorter than outlined in SAE J1926-1, one of the issues that could come up is that the O-ring may not make a seal. If your port deviates from the thread length detailed in SAE J1926-1, you will lock yourself into a lower pressure port.

After a port is created too shallow by mistake, some designers will resort to specifying a custom fitting that has ORFS paired with an SAE J1926-3 stud. While the custom fitting can seemingly alleviate the issue at hand, the concern is that you have now lowered the working pressure capability of your system. The SAE J1926-3 stud carries the working pressure of the L-series (light duty) ports, not the high duty port that is used with ORFS fittings.

Sealing Surface Design Considerations

We've detailed what to look for on the port in our previous post: Leaking Ports? Troubleshooting SAE J1926 and ISO 6149 Ports. When designing a system, it can be important to have a good understanding of where the sealing surface is and how to create a successful seal. We've shown that in figure 2, notice, it is where the O-ring meets the stud and port.

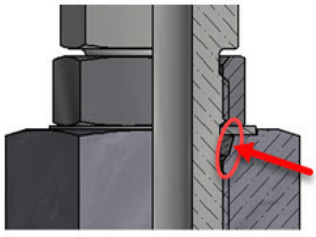

Figure 2. Sealing surface

Below are the three key things that should be considered during the design and manufacturing process:

- No vertical grooves on the sealing surface, they will cause a leak path.
- No sharp leading edge, they will damage the O-ring.
- Depth of the O-ring gland area, shown in Figure 3 as L1. If it's too short this leads to O-ring overfill, meaning the volume of the gland is not sufficient for the O-ring.

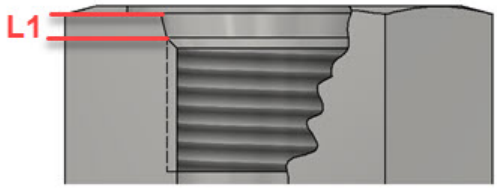

Figure 3. O-ring gland area

Since the O-ring is critical for sealing, it is imperative that you ensure your port protects the O-ring. If there is damage to the O-ring during assembly:

- It will compromise the seal.
- The system becomes more susceptible to pressure failure.
- And the O-ring breaks as a result of the damage, the pieces could enter the system and contaminate it.

Why is all of this so important?

Designing is the first step towards a successful system. From initial assembly through maintenance work, the last thing you want in a design is something that doesn't make sense to anyone other than the person that designed it. Cutting corners in the design and/or manufacturing process can cause many issues down the line. If your port is not correct, you have left the assembler no easy path forward. Many of these problems could lead to needing to re-make or re-buy a very expensive port, as the ports are often integrated into a larger component.

Use SAE J1926-1 as the key for port design, read it, understand it, know with confidence the port you are designing is correct.

Checklist for fluid systems with SAE J1926 ports

Designing a port incorrectly can cause issues for years to come. Use this list as your checklist in the SAE J1926 port design process:

- Use SAE J1926-1 for all port dimensions.
- Does this port meet my pressure requirements?
- Sealing surface is designed and manufactured smooth, per SAE J1926-1.
- Leading Edge is not sharp.
- Correct O-ring gland depth used.
- Consider other components surrounding the port and fitting, both internal and external.

With a thorough design process, you will cause less headaches for many people who work on your system after you're finished. You will also be more confident that you are designing systems correctly. As always, if you are unsure on your design or have questions, reach out to a Parker team member and we can answer any questions that may come up. It's easier to ask at the beginning, rather than make an assumption that may end up being incorrect. We're here to help you design with confidence.

If you have any questions or comments, please post them, and we will respond if warranted. To talk to our techConnect engineer team directly, they can be reached at Parker Tube Fittings Division, 614.279.7070. See Parker Tube Fittings Division's full line of tube fittings and hose adapters.

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