



Obtaining the Weld Quality You Need

What to Look for in a Cleanroom
Welding Contractor





What is Cleanroom Welding?

Welding within a cleanroom ensures that there is a low level of contaminants such as dust, airborne microbes, aerosol particles, and chemical vapors in the environment. Pre-filtered HEPA (high-efficiency particulate air) handling units, temperature gauges, and humidity controls all help to maintain the purity of these facilities.

TIG (manual GTAW) and fusion orbital welding (automatic GTAW) are often employed in cleanroom fabrication operations to weld similar and dissimilar metals together. These high-purity methods are crucial for highly sensitive manufacturing procedures, such as joining the tubing and fittings for semiconductor devices, where contamination can destroy products.

Ensuring part quality and consistency, the controlled environment of a cleanroom effectively regulates the concentration of airborne particles in order to prevent contamination that could not only lead to hundreds of thousands of dollars' worth of losses, but also threaten the safety of the end user.

100 vs. 1000 Classification Levels

There are two main standards of classification to determine the “cleanliness” of a cleanroom. The U.S. Federal Standards (209e) for cleanrooms classify laboratories by the number of particles greater than or equal to 0.5 μm per cubic foot of air. The “cleanest” cleanroom would be considered a Class 1, while the “dirtiest” would be Class 100,000.

Each domestic classification then has a coordinating International Standards Organization (ISO 14644-1) classification, a 1-9 ranking measuring particulate as a decimal logarithm of the number of particles greater than or equal to 0.1 μm per cubic meter of air. For reference, the particulate concentration in the air of an ordinary room is approximately 1,000,000 particles per cubic meter, or ISO 9. Free-flowing air in a city has about 35,000,000 particles per cubic meter.



Class 100

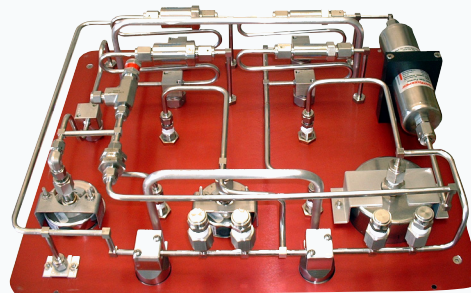
By Federal Standards, a Class 100/100 cleanroom has fewer than 100/100 particles that have a diameter of .5 microns or larger per cubic foot of air space. U.S. Federal Standard 209e cleanrooms are equivalent to an ISO rating of 5 (meaning, at most, 100,000 particles per cubic meter). Following exact protocol to maintain the cleanroom environment is critical; something as simple as a torn glove could contaminate the sterile atmosphere.

Highly sensitive industries and applications, such as those seeking FDA approval, may require Class 100 cleanrooms to ensure complete purity in their operations. Specific cleanroom industries include nanotech, semiconductor, biotech, pharmaceutical, life sciences, and aerospace, as well as critical process manufacturing facilities such as solar, optics, medical devices, military, and the Department of Energy.



Class 1000

A Federal Standard Class 1000 cleanroom has fewer than 1,000 particles per cubic foot, and is the equivalent to an ISO 6 classification. Though these facilities allow slightly more particulate in the air than a Class 100 facility, they are still pure environments used extensively in the design and build of critical-application equipment.



HPS's Certifications

At HPS, our cleanroom is certified to U.S. Federal Standard 209e as a Class 100 facility, compliant with ISO standards. In this ultra-high purity laboratory — operating 24 hours a day, 365 days a year — our expert team of ASME Section IX certified welders can build and replicate parts to exact OEM specifications.



Permanent vs. Temporary Cleanrooms

Depending on a manufacturer's specialization and specific line of work, their facility may include either a permanent or a temporary cleanroom to carry out high-purity operations. Temporary rooms can vary widely in their use and construction; they may be constructed from prefabricated modular designs, for instance, or an unused storage room may be converted into a cleanroom for a short period of time. Permanent cleanrooms, on the other hand, are just that: dedicated rooms with dedicated equipment for cleanroom welding and nothing else.



Hard-wall, permanent facilities provide a number of benefits. Designed specifically for the location and environment into which they are built, they're often indicative of a manufacturer's commitment to quality. Rather than collecting dust or being folded up until their next use, these facilities are operational 100% of the time, which helps maintain their cleanliness and specifications year-round, as cleanrooms must be recertified each time they are taken out of service.

Before selecting a subcontractor for cleanroom welding, customers should ensure the facility has up-to-date certifications and has not been shut down or used for other purposes, which could contaminate the area for future projects.

HPS manages a permanent Class 100 cleanroom for ultra-high purity fabrications. Since it was first built in 1997, our in-house cleanroom has remained fully operational and compliant year-round thanks to routine maintenance and certification checks.

Skilled Welders and Patented Processes

No matter how clean a weld may be, it is useless if it's not of high quality — and sometimes quality isn't detectable from the outside. An experienced welder can identify even the slightest deficiencies, make real-time adjustments, and eliminate issues that would affect the QA process and compliance with strict welding standards.



Good welders are more than just button pushers; they can create and modify their own welding programs, allowing them more autonomy and accountability for their work. They also understand that material selection and other decisions can contribute to weld shifts, bead meander, bead width issues, and concavity and convexity issues.

Knowing the equipment and its capabilities — from the power supply to fixtures and weld heads — and understanding how to tweak the welding parameters help welders prevent unforeseen issues, production downtime, and associated costs.

At HPS, every welder on our team completes a five-year apprenticeship-to-journeyman program to hone their craft and learn new skills. They are trained in-house on our systems and equipment, including specialized cleanroom protocol and our seven proprietary tools, which include a back purge instrument and a Go/No Go weld profile gauge. Through our extensive training programs and patented processes, the HPS welding team delivers high-quality, repeatable welds for all our customers.



A Track Record of Success

Selecting a manufacturer with a wealth of cleanroom experience will drastically reduce the risk of something going wrong on the job. The right cleanroom welder can be the difference between a smooth production run with minimal downtime, and hundreds of thousands of dollars' worth of bad product and lost time.

With over 30 years in business and two decades running an in-house cleanroom facility, High Purity Systems understands the importance of reliable cleanroom welding. Offering TIG, fusion orbital, wire feed orbital, stick, and MIG welding, we're committed to delivering each and every customer pure, precise welds for all applications and industries.



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To learn more about our cleanroom capabilities and how HPS can help you get started on your next project, [contact us](#) today.

About High Purity Systems

With over 30 years of experience, High Purity Systems understands the high stakes of the industries we serve; in many cases, human safety hinges on the precision of a weld and the purity of a system. When working with our customers, we commit to delivering the highest quality service within the strict requirements of your environment.

For more information about how HPS can help you with your next cleanroom welding project, contact our team today.

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