

When it comes to manufacturing air distribution components for sterile environments, there's no room for error. And because perfection is required for long-lasting, functional HVAC components, the right material and manufacturing processes are important factors.

For everything from [stainless steel grilles](#) to air diffusers to HEPA filtration systems, the stainless steel air distribution industry is vitally important for commercial use in hospitals, laboratories, pharmaceutical production, and more.

Types of stainless steel used in manufacturing

[Stainless steel HVAC products](#) are generally made from Type 304 or Type 316 stainless steel.

Type 304 includes chromium-nickel and is a widely-used austenitic stainless steel. Type 304 alloys are modifications of 18 percent chromium and 8 percent nickel austenitic alloy.

Type 316 stainless steel is a molybdenum-bearing stainless steel, with just 2 percent molybdenum to increase corrosion resistance and oxidation. Type 316 also is more resistant to many chemicals, including sulfuric acid, chlorides, bromides, iodides, and fatty acids, even at high temperatures. This resistance makes it ideal for use in pharmaceutical manufacturing applications.

Both are easy to fabricate and easy to clean, and can come in a variety of finishes and appearances to blend seamlessly into or aesthetically complement clean environments or commercial settings.

The manufacturing process

Made-to-order stainless steel HVAC product manufacturing requires a multi-step process to fulfill orders for worksites. Because each item is made especially for specific sites, it's important that the fabricators complete their work on time to suit the needs of individual projects.

The process begins once the client places an order. With the order in, the stainless steel fabrication company can create 3D smart models, which will be used on the shop floor to make each component.



Laser cutting

Using the 3D smart models, automated software lays out parts on sheet metal in such a way as to minimize wasted materials.

High-tech lasers then cut out each piece as quickly as 400 inches per minute, and are impeccably accurate, which is necessary in the air distribution industry.

CNC press brakes

After laser cutting is complete, the metal shapes are moved into CNC press brakes, where the stainless steel parts are bent into the correct shape, again following the 3D models input into specialized software.

The process is overseen by human experts to ensure each piece is manufactured to the most exacting specifications.

Robotic welding

Next, the bent and shaped metal is moved over to a robotic welder. This computerized six-axis welder precisely joins airtight seams.

Consistency is key, and robotic welding tools ensure it happens.

Roll forms

Now that frames have been bent and welded, individual fins and blades for grilles, including simple [return grilles](#), are cut to size in place and rotated to their proper angle. It is at this point in the process that it becomes easy to identify what is being manufactured.

Washing

The wash system ensures each HVAC component is free from dirt and oil accumulated during the production process.

Each part travels through a heated, alkalized wash cycle, with a heated deionized rinse and a fresh water rinse.

Every piece spends time in a drying oven to eliminate any traces of moisture before getting a polish or powdercoat. For critical, sterile environments, antimicrobial coating is applied during this step.

Finalized hand assembly and leak testing

After cleaning, production staff manually assemble the remainder of the components. Precise movements

and expertise are required to meet stringent quality standards. Once the build is complete, it's time to check that those standards have been met.

This is done during a leak test in a HEPA unit leak test booth. Equipped with a photometer, the booth ensures each product meets standards for critical environments set forth by the Institute of Environmental Sciences and Technology (IEST). If the HVAC product passes the test, it moves onto packing and shipping.

If it doesn't pass the test, the issues are rectified, or the piece is completely remade.

Packing and shipping

If meeting high standards and being crafted to exact specifications is important in the manufacturing process, it's just as important in the packing and shipping step.

Each item must be packed into a customized box to avoid damage during shipping. Minor dings and dents can render a stainless steel air distribution component unusable, particularly because it can cause air leaks, which are unacceptable in critical environments where air must be clean.

Once boxed, items are stacked on pallets and stretch-wrapped together for protection during shipping.

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Source: [The stainless steel air distribution industry](#)