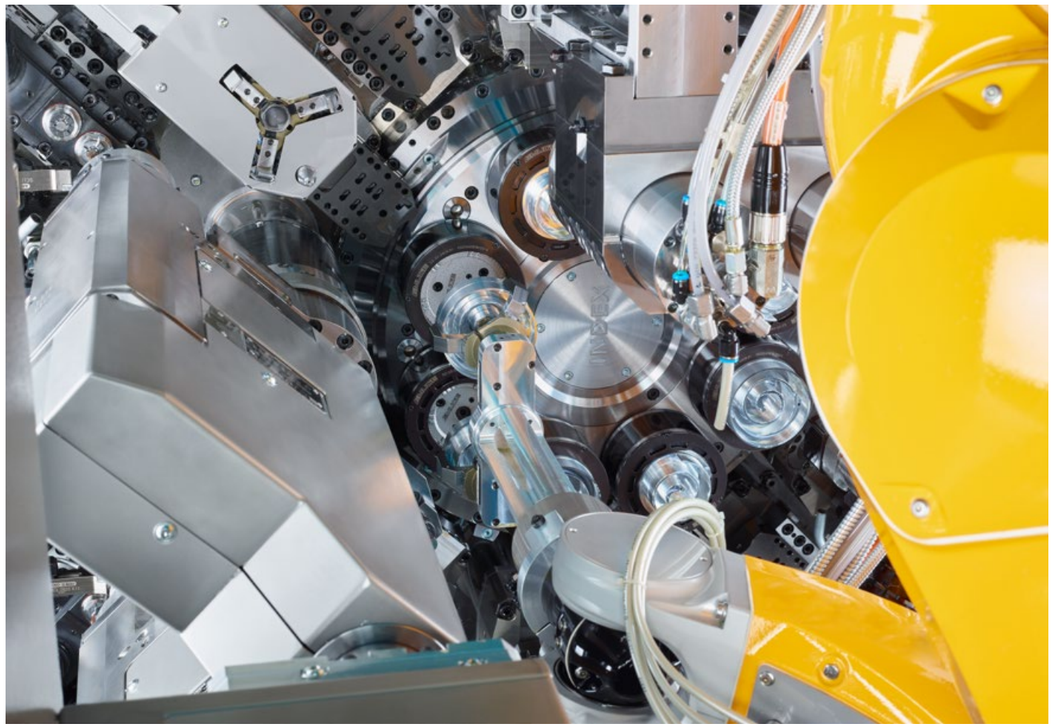
Everything revolves about scrolling

Scroll compressors are becoming increasingly important and are required in large numbers. The multi-spindle team therefore developed a process based on the INDEX MS40-8 that allows for both spiral-shaped functional components to be manufactured with the highest precision and very short cycle times.



What is a scroll compressor?
Scroll compressors are used to increased the pressure of gases. They essentially consist of two functional components with interlocking spirals. While one of the parts remains fixed, the other moves along an excentered circular path. The spirals thus form rotating chambers whose volume becomes smaller with each rotation. The gaseous medium is increasingly compressed. When it reaches the middle, the scroll compressor pushes the compressed gas through an opening into the connected pipe.

Efficient scroll production on the INDEX MS40-8

Our INDEX MS40-8 CNC multi-spindle lathe is extremely versatile. One good example thereof is the scroll machining system we developed. This variant can create precision in the µm range. It can hardly be surpassed in terms of cost-effectiveness when it comes to large-scale production.

Benjamin Klotz heads the Development & Design team for multi-spindle automatic lathes at INDEX

Scroll compressors are increasingly being used in cooling systems, air conditioners, and heat pumps. They are also used in hybrid and electric vehicles to cool down electric motors, batteries, and the interior of the vehicle.

It does not take much to predict the increasing demand for certain components. Yet, the two spiral-shaped functional components of a scroll compressor do not appear to be typical components for a multi-spindle automatic lathe at first glance. However, after further consideration, our developers have found a way to use the strengths of the multi-spindle lathe for the required machining operation.

Tolerances in the lower µm range

A careful selection of the individual process steps allows for the entire machining of the workpieces from blank to finished part to be performed in a machining pass. This allows the traditional premachining of the workpieces to be omitted. The clamping technology that is implemented guarantees that the highly precise shape and position tolerances are observed. A total of four high-frequency spindles running at speeds up to 30,000 rpm are implemented for the milling operations. This results in a cycle time per workpiece that is only about 25% (!) of that for current manufacturing solutions on machining centers—and with a significantly reduced required floor space to boot.

Fully equipped with additional components

The INDEX MS40-8 is fully equipped with eight main and two counter spindles, as well as all sorts of tool slides. The scroll machine does not include a bar feeder. Instead, an integrated robot feeds the machine with blanks made of forged or cast aluminum and up to 100 mm in diameter.

High surface quality

Conventionally, these scroll components are milled on machining centers with a central clamping device. In this case, the spiral is obtained by interpolating the X and Y axes. This creates the disadvantage that the milling spindles must pass through four reversing points, in which an axis changes the direction of travel. This may lead to inaccuracies. ›

Machining on a multi-spindle automatic lathe has the advantage that the component rotates. Therefore, only one linear axis and one rotary axis are required to let the milling cutter travel along the spiral from the outside towards the inside and back on the other flank. This means that both spiral flanks are machined in one continuous step, which is apparent from the high surface quality.

Considerable savings

The cost-effectiveness of a multi-spindle automatic lathe is undisputed when it comes to large quantities. In addition to clearly reducing cycle times, high productivity per unit area and minimal operator effort also come to bear.

We will be showing scroll machining live in action at the EMO 2023 on the INDEX MS40-8 as a double four spindle machine. **X**

INDEX MS40-8 machine highlights

- Compact spindle drum with eight integrated fluid-cooled motor spindles
- The ideal speed can always be programmed for each spindle position and cutting tool edge
- Highly-dynamic slides with slideways (X axis)
- Non-wearing Z axis owing to quills with hydrostatic support
- Chuck part machining with robot loading and unloading
- Fast swiveling synchronized spindles with C-axis for rear-end machining

Find out more:
› **www.index-group.com/ms40-8**