

ROTARY UNIONS

For Machine Tools, Machining Centers and Transfer Lines



INFORMATION FOR DESIGNERS OF MACHINE TOOLS

OPERATING PRINCIPLES OF ROTARY UNIONS

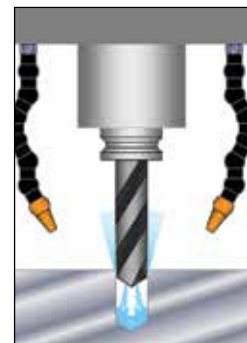
Advantage of Through-Spindle Coolant (TSC)

High-speed cutting tools require both cooling and lubrication to reduce the rate of tool wear and to prevent overheating, which degrade the tool's strength. Flood coolant systems spray coolant fluid onto the work piece near the cutting tool. But for many machining operations, such as milling or hole drilling, these systems are less effective at getting coolant fluid to the cutting edge.

In machining centers with through-spindle coolant (TSC), coolant fluid is conducted directly through the cutting tool to cool the cutting edge, reduce friction, and remove chips. Coolant flows axially through a Rotary Union into the spindle and tool holder directly to the heat source. Compared to flood coolant systems, TSC pays for itself in terms of lower operating costs for tools and coolant. Better control of tool overheating also allows faster feed rates and higher productivity.

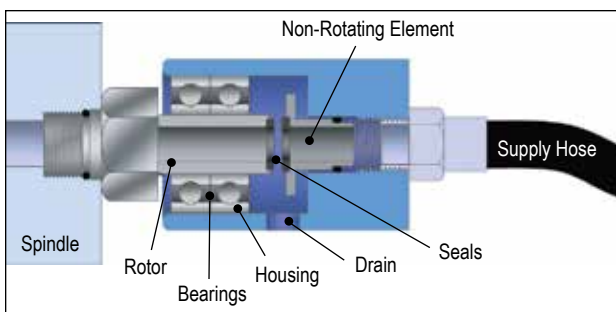


Flood Coolant



Through-Spindle Coolant

Parts of a Rotary Union



How Rotary Unions Work

A Rotary Union is a precision mechanical device used to transfer coolant fluid or media from a stationary source, such as a pump, into a rotating device, such as a spindle with cutting tool. The typical coolant fluid is water-based, consisting of approximately 85-95% water for cooling, 2-12% oil for lubricating the cutting edge, and a small amount of other chemicals. *DEUBLIN* Rotary Unions also can transfer air/oil mist, known as MQL, cutting oils, and even dry air.

A typical Rotary Union consists of a rotor that spins at the same speed as the machine tool spindle, a non-rotating element that closes precisely against the rotor, a housing that connects the supply hose to the non-rotating element, and seals that contain the coolant fluid. Bearing-supported unions connect the rotor to the housing with one or more bearings. Bearingless unions omit these bearings. Depending on the application, the housing may have one or more drain connections.

For positive sealing, smooth rotation, and long service life, all *DEUBLIN* seals are micro-lapped with proprietary machines and compounds to achieve an optical flatness of 2 light bands (23 millionths of an inch, or 0.58 microns). In addition, all *DEUBLIN* coolant unions use seals made from special grades of silicon carbide for superior resistance to wear and heat accumulation.



Micro-lapped *DEUBLIN* seal

Bearing or Bearingless?

Rotary Unions for machine tool applications are available in bearing-supported and bearingless configurations. Each kind has advantages and disadvantages for the machine tool designer.



INFORMATION FOR DESIGNERS OF MACHINE TOOLS

SELECTING THE RIGHT UNION FOR YOUR APPLICATION

Bearing-supported unions are easy to install and replace, because of their one-piece design. *DEUBLIN* makes two different mounting styles. The **rotor-mounted** style attaches to the machining center with a threaded rotor. The **bore-mounted** style slides into a precisely machined counterbore at the end of the spindle. A second advantage of both styles is that any leakage is channeled by the housing into a drain line.

Bearingless unions provide the machine tool designer with several advantages. First, eliminating bearings reduces cost while allowing an increase in maximum rpm. Second, since only a small rotor is directly attached to the spindle, there is no possibility for the union's housing to be a source of vibration. Third, without bearings the union is immune to side loading from, for example, too much tension in the coolant supply hose. Fourth, bearingless unions can be very small, ideal for applications with multiple, closely spaced spindles.

Which *DEUBLIN*® Seal Technology?

DEUBLIN offers **five** different seal technologies, in order to provide the best solution for every machining application. Only *DEUBLIN* can offer such flexibility to the machine tool designer.

Closed Seal: As the name indicates, the seals stay closed with or without coolant pressure. Therefore, drain lines generally are not required. However, all rotary unions operate with a thin film of media between the seals. Over time, small, nearly invisible quantities of media can migrate across the seal faces. Therefore, proper venting provisions should be made.

Controlled Leakage: The opposite of closed seals, controlled leakage seals always have a small gap between the seals, even when pressure is applied. For this reason, controlled leakage unions are excellent for high-speed applications with pressurized dry air.

Pop-Off™: This kind of seal closes only when pressure is applied. When pressure is removed, the seal faces separate by a very small distance. This eliminates friction and seal wear during operation without coolant, and therefore allows unlimited “dry running” at high speeds. Pop-Off™ designs should be considered when machining will occur with and without through-spindle coolant (TSC).

AutoSense®: The latest in a series of *DEUBLIN* innovations, this technology combines the best features of Pop-Off™ and controlled leakage designs. Like Pop-Off™ designs, AutoSense® seals close when coolant pressure is applied to contain the coolant fluid, and “pop” apart in the absence of coolant pressure to allow unlimited dry running. Like controlled leakage designs, AutoSense® seals handle pressurized dry air by creating a microscopic gap between the seal faces. AutoSense® unions handle coolant, MQL, and dry air by sensing the kind of media and automatically changing seal operation in response.

All-Media: This technology gives the machine designer complete control over seal opening and closing. By controlling how the pressure is applied to the union's multiple connections, the machine designer can cause the seals to separate when necessary.

The table below summarizes the operation of each seal technology with different media.

Media	Seal Technology				
	Closed Seal (1005, 1101,1108, 1116, 1117 Series)	Pop-Off™ (902, 1109, 1121,1151 Series)	All-Media (1139 Series)	AutoSense® (1114, 1124, 1154, 1159 Series)	Controlled Leakage (1115, 7000 Series)
No pressure	Dry run possible depending on model	Seals open automatically to prevent dry running			
Pressurized air		Not recommended with rotation	Micro-gap between seals to prevent dry running		
MQL	Seals are closed				
Coolant					

Since its founding in 1945 as a small, family-owned business, Deublin consistently has adhered to a policy of designing and building the best products of their kind in the world. The result of this policy has been continuous growth through the years, and for this we are grateful to our many loyal customers.

Today, Deublin is the world's largest manufacturer of Rotary Unions, with state-of-the-art factories, technical sales and services, and local stocking in 13 countries on four continents, as well as a worldwide distribution network operating in more than 60 countries. Our global organization and extensive catalog of field-tested products ensure a precise match between each customer's requirements and an engineered solution. Deublin has been part of the HOERBIGER Group since 2019 and forms the core of the Rotary Solution division.

We cordially invite you to visit our modern manufacturing facilities in Waukegan, Illinois, USA; Mainz, Germany; Monteveglio, Italy; Dalian, China; and Diadema, Brazil.



Our Global Headquarters in Waukegan, Illinois, U.S.A.



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