DEUBLIN®

ROTATING UNIONS

Instruction Manual

1112-240-001
Two-Channel Bore-Mounted Rotating Union for MQL Service and Dry Running

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Please read this instruction manual carefully and thoroughly before installing the ***DEUBLIN*** Rotating Union. This instruction manual contains important information about proper installation, operation and maintenance.

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Features

- Two channels for MQL mixed in the spindle.
- Inner channel with patented Pop-Off™ seal technology allows unlimited dry running without lubricating media such as oil or water-based coolant.
- Outer channel with patented AutoSense™ seal technology allows unlimited dry running and contains pressurized dry air with no seal wear or heat generation.
- Accepts up to 15 mm of axial drawbar movement.
- Bore-mounted design for easy installation and compatibility with most European-made motor spindles.
- Labyrinth system and large drains to protect ball bearings.
- Balanced mechanical seals made from silicon carbide for long life even with contaminated or poor quality media.
- Anodized aluminum and stainless steel parts resist corrosion.

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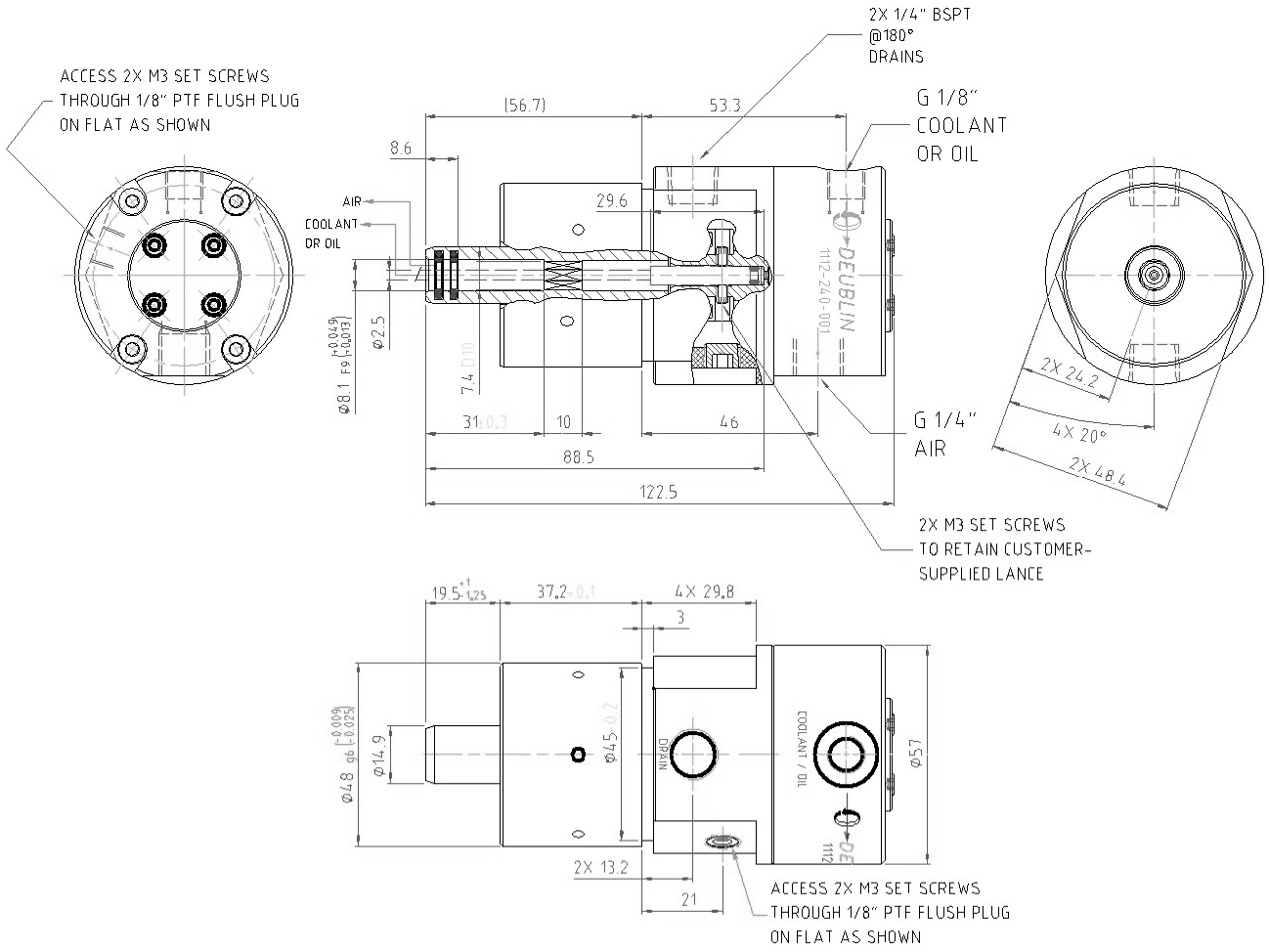
Dimensions



Operating Parameters

The **inner** channel of 1112-240-001 uses ***DEUBLIN*** patented Pop-Off™ seal technology. 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). Because the seals separate during tool changes, when coolant pressure is off, residual coolant in the supply hose and spindle can drain past the seal faces. Therefore, a Pop-Off™ union requires a downward-pointing drain line to direct such residual coolant into the sump. Pop-Off™ seals are not intended for rotation with pressurized dry air.

The **outer** channel of 1112-240-001 uses ***DEUBLIN*** patented AutoSense™ seal technology. 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. In addition, 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. As with pop-off seals, a drain line is required.

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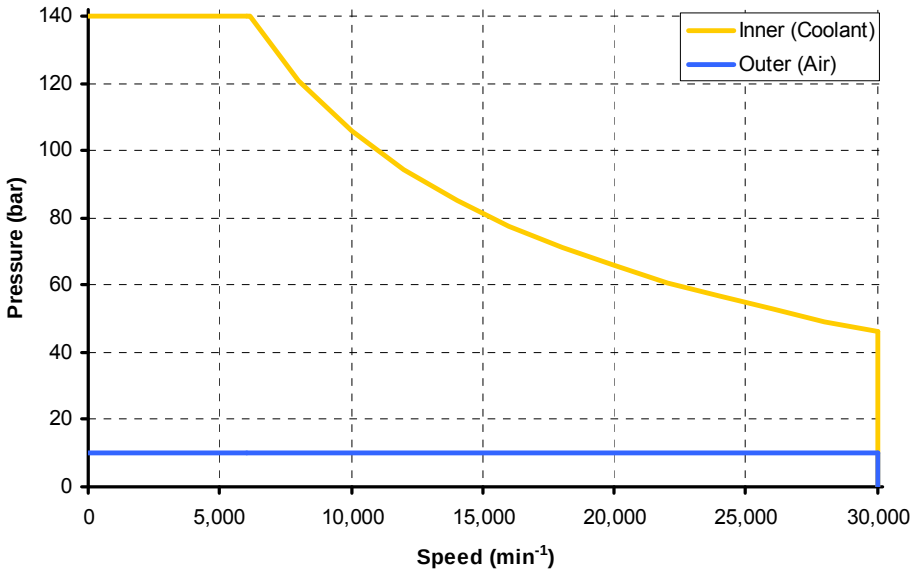
	Inner channel	Outer channel
Maximum speed	30,000 min^{-1}	
Seal technology	Pop-Off™	AutoSense™
Media	Coolant or light oil	Air
Maximum media pressure	140 bar up to 6,100 min^{-1} 10 bar up to 30,000 min^{-1} → see Chart A	10 bar (145 psi) up to 30,000 min^{-1}
Maximum recommended flow	6 L/min (1.6 GPM)	18 NL/sec (38.1 SCFM)
Minimum pressure to close seals	1.5 bar	2 bar
Minimum flow to close seals	1.5 L/min (0.4 GPM)	
Axial force on drawbar (as a function of media pressure)	5.02 N/bar	
Maximum operating temperature	71° C (160° F)	
Minimum operating temperature	5° C (41° F)	

Chart A – Speed vs. Pressure



When used within the combinations of speed and coolant pressure shown in Chart A, 1112-240-001 is designed to operate for many thousands of hours. Please consult Deublin if your application requires simultaneous speed and pressure beyond these limits.

Media Filtration

Deublin unions are designed to handle the various coolant contaminants found in most manufacturing facilities. To ensure long union life and maximum productivity, however, coolant filtration should conform to ISO 4406:1999 Code 17/15/12, SAE 749 Class 3, or NAS 1638 Class 8, with a maximum particle size of 60 microns.

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ISO 4406:1999 Code 17/15/12	
Particle size (µm)	Particles per 100ml
4 – 6	≤130,000
6 – 14	≤32,000
14 – 60	≤4,000

NAS 1638 Class 9	
Particle size (µm)	Particles per 100ml
5 – 15	≤64,000
15 – 25	≤11,400
25 – 50	≤2,025
50 – 60	≤360

SAE 749-1963 Class 5	
Particle size (µm)	Particles per 100ml
5 – 10	≤87,000
10 – 25	≤21,400
25 – 50	≤3,130
50 – 60	≤430

Unacceptable

(ISO 21/19/17 at 100x)

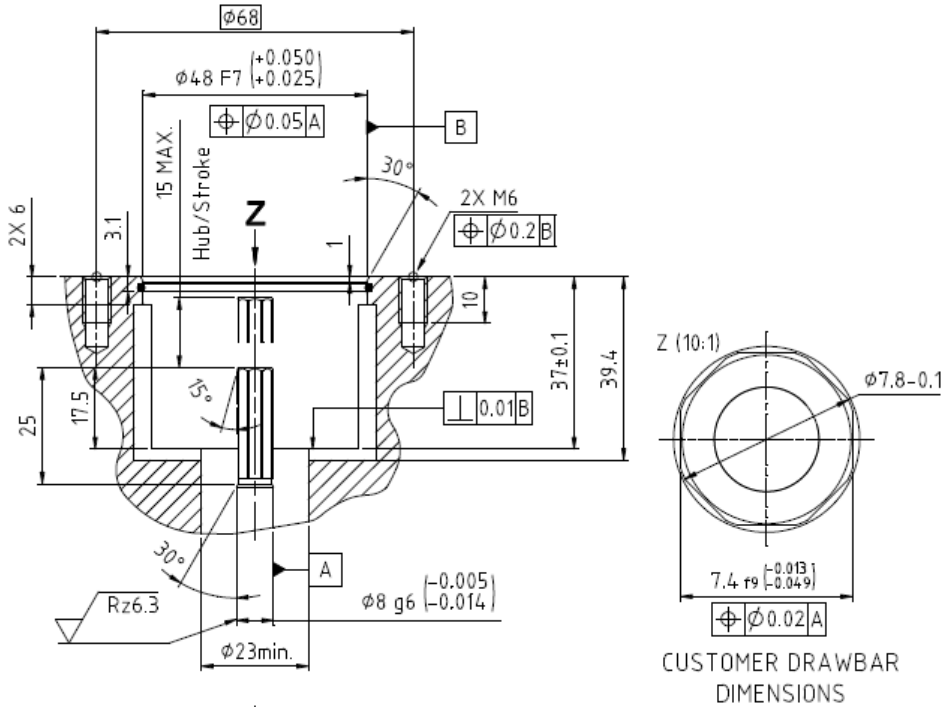
Acceptable

(ISO 16/14/11 at 100x)

Only pure water should be used to make up for coolant evaporation. Calcium and magnesium salts in most tap water shorten coolant life, by depleting the chemicals in the coolant, by breaking down the water-oil emulsion, and by encouraging bacterial growth. These salts also can cause residue to build up inside the rotating union, leading to premature failure. Proper coolant maintenance also prolongs tool life and improves the surface finish of your parts.

Interface with Machine

1112-240-001 is designed for installation in a 48 mm counterbore with a 7.4 mm octagonal drawbar extension. This configuration sometimes is found most often on European spindles and machine tools. Detailed interface dimensions are shown in the drawing below.



To avoid damage to shaft seals inside the rotating union,
no sharp edges are permitted on the male octagonal section of the drawbar extension.

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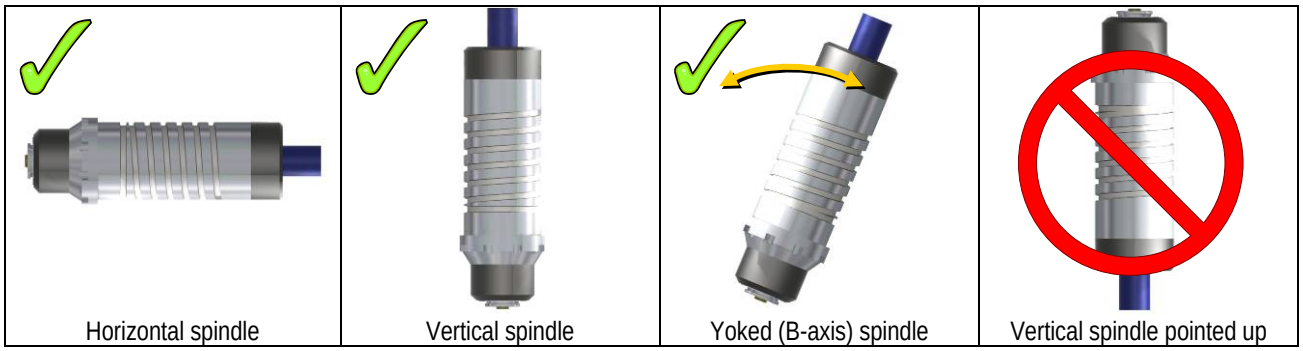
Installation Procedure

1112-240-001 is suitable for horizontal, vertical, or yoked spindle (B-axis) applications. In vertical applications, the rotating union should be installed with the rotor pointed down. Although the union will operate with rotor pointed up, in this orientation the union is more easily affected by media contamination and incorrect drain hose position. Therefore, this orientation is *not* recommended.



Horizontal spindle | Vertical spindle | Yoked (B-axis) spindle | Vertical spindle pointed up

A ***DEUBLIN*** rotating union is a highly engineering piece of equipment, containing precision bearings and many small parts. Dropping the union, using it as a hammer, or applying excessive external forces can cause internal damage and shorten the union's operating life.

To install the ***DEUBLIN*** 1112-240-001 rotating union, follow these steps:

1. Measure runout near the end of the drawbar extension, using hand rotation of the spindle and a dial indicator. If runout exceeds 0.050 mm, then adjust the drawbar extension to minimize runout.

2. Make sure that shaft seals in union are clean. GENTLY remove any visible contaminants, then lubricate both shaft seals in the union rotor with O-ring grease.

3. Make sure drawbar extension is clean. Lubricate sliding diameter of the drawbar extension with O-ring grease.

4. Make sure end of lance is free of debris and contaminants. Lubricate the lance O-ring with O-ring grease.

5a. Remove the 1/8" PTF flush plug that is pre-installed into a flat surface of the union. Rotate the union rotor until one of the two M3 set screws is visible. Loosen set screw completely, then engage the threads and turn clockwise NO MORE than two full turns.

⚠ If set screw is turned more than 2 full turns after thread engagement, the lance O-ring may be damaged during lance insertion. A damaged lance O-ring can allow coolant to leak into the air channel.

5b. Rotate the union rotor 180° until the other M3 set screw is visible. Loosen set screw completely, then engage the threads and turn clockwise no more than 2 full turns.

6. Insert lance into union rotor approximately 88 mm (3.5"), until it can slide no further. Be sure to keep the lance centered in the union rotor during insertion.

7. GENTLY tighten one of the M3 set screws approximately one full turn, until it just touches the lance. Do NOT tighten set screw completely. Rotate the union rotor 180° and repeat this for the other M3 set screw.

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8. Alternating between the two M3 set screws, tighten each no more than 1/4 turn at a time, until the lance is held securely. Re-install the 1/8" PTF flush plug into the union housing.

9. Slide lance gently into drawbar extension, then slide union onto drawbar extension and into 48 mm counterbore on spindle or unclamp unit. Before mounting union, be sure that male octagon on drawbar extension and female octagon in union rotor are aligned. Union should slide easily until circumferential mounting slot is nearly even with top of counterbore.

⚠ If octagons are not aligned, the union will slide in only about halfway. If the union does not slide easily, remove it and try again. DO NOT force the union by pushing harder, by hitting it, or by other methods. Such efforts only will damage the union or drawbar extension.

10. Rotate the union for correct drainage. In a yoked spindle installation, one of the two drain connections must point to whichever side of the spindle is lowest during tool change. In a horizontal installation, one of the two drain connections MUST point straight down (to 6 o'clock). In a vertical installation, orientation of the drain connections is not critical.

Fix union in place with (2) mounting tabs and (2) M6 socket head cap screws. Tighten both screws to a minimum of 13 Nm (9.6 ft-lbs).

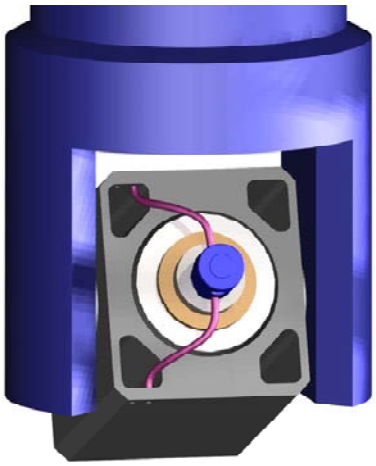
11. In a yoked spindle installation, attach a drain hose to each of the two drain connections on the rotating union. In a horizontal installation, attach a drain hose to the drain connection at 6 o'clock and plug the drain connection at 12 o'clock. In a vertical installation, attach a drain hose to one or both drain connections, and plug any unused drain connection.

⚠ Each drain hose must slope downward continuously from the union. For longest life, it is recommended to have always at least 15° downward slope.

⚠ Each drain hose must have NO orifices, plugs or flow restrictions of any kind.

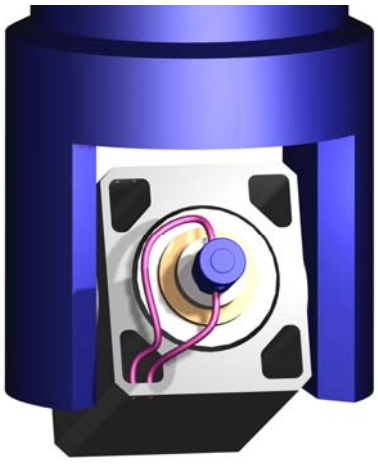
⚠ Each drain hose should have the maximum possible inside diameter (I.D.). A drain hose I.D. of AT LEAST 6 mm is recommended. Otherwise, over time it is possible that small chips in the coolant can accumulate and block the drain. Do NOT use a drain hose made from plastic air tubing, because the 3 – 4 mm I.D. typical of such tubing is too small for proper drainage.

YES!



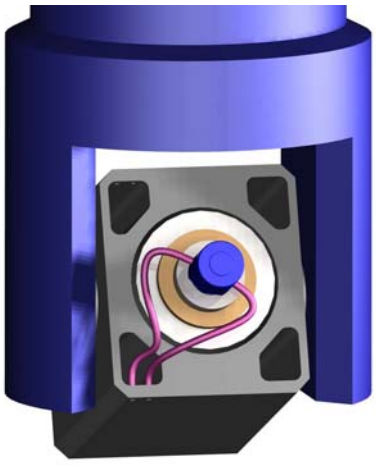
At all spindle orientations, at least one drain hose is at 6 o'clock and slopes down continuously.

NO!



When the spindle pivots to the other side, both drain hoses will slope up.

NO!



Drain connection is not at 6 o'clock. At some spindle orientations, both drain hoses slope up.

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12. Attach the coolant supply hose to the G1/8" media connection. Attach the air supply hose to the G1/4" media connection.

⚠ The media supply must be flexible hose. Do not connect rigid pipe to the rotating union.

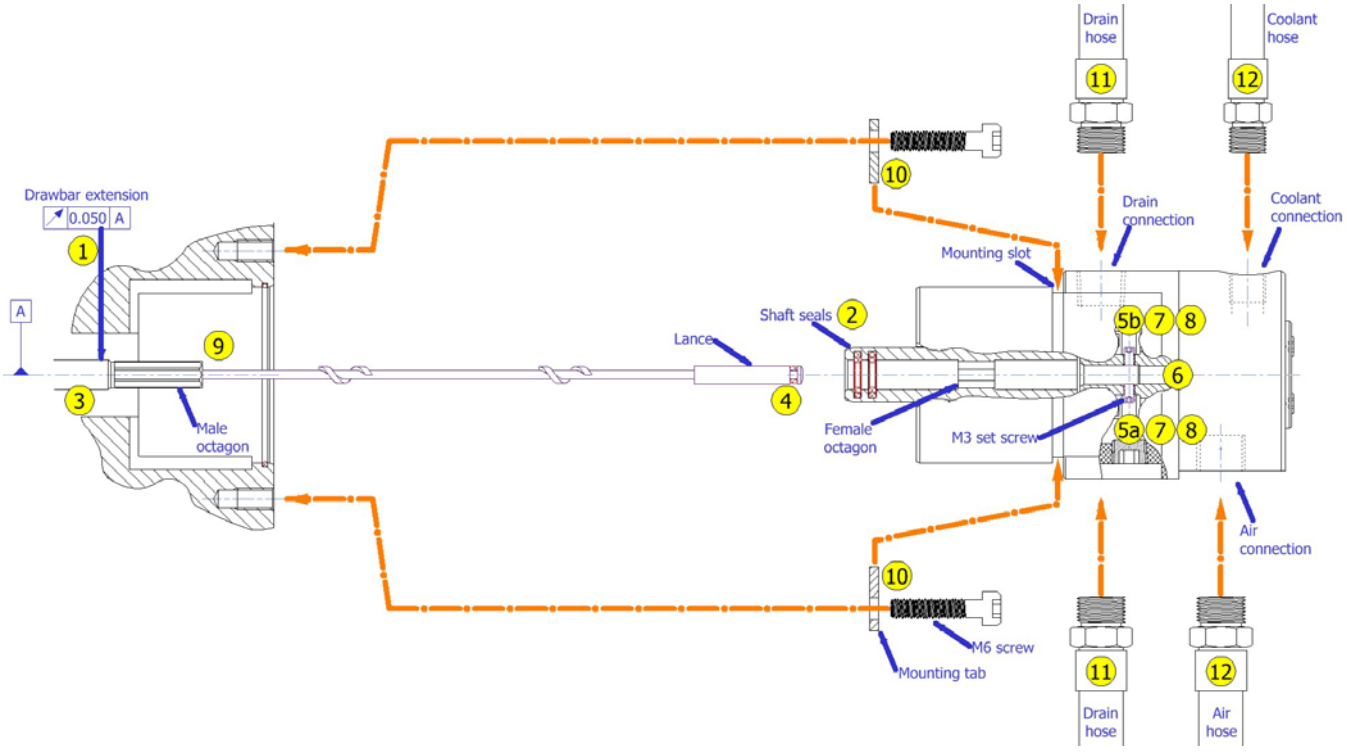
Physical installation now is complete. To confirm correct installation and operation of the ***DEUBLIN*** 1112-240-001 rotating union, follow these steps before replacing any cover panels:

13. Start spindle rotation at 1000 min^{-1}. Listen for any unusual noises coming from the rotating union, such as buzzing, rattling, or squealing. Increase spindle speed in steps, according to the spindle manufacturer's recommendation, until the maximum operating speed is achieved. If unusual noises are heard, consult the Troubleshooting section below.

14. Start spindle rotation at 1000 min^{-1} with no tool in the tool holder. While the spindle is rotating, turn on ONLY the coolant flow (inner channel) for 10-15 seconds, then turn off the coolant flow. Repeat this three times. If everything is functioning correctly, one will observe:

- A strong stream of coolant coming from the spindle nose while coolant flow is on.
- At most a few milliliters of coolant dripping from the drains when coolant flow is turned on, and again when coolant flow is turned off. No coolant should issue from the drains at any other time.

If drain leakage or the stream of coolant does not meet these guidelines,, consult the Troubleshooting section below.



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Preventing Premature Seal Failure

During tool change, most machining centers supply air flow to keep the taper of the drawbar mechanism clean. When this air flow is supplied through the union and the new tool is "dead-ended" (i.e., not designed for through-spindle coolant), air pressure may become trapped between the new tool and the check valve in the air line, thereby keeping the Pop-Off™ seal faces closed. Subsequent spindle rotation without coolant will cause overheating and premature failure of the seals. To avoid this, trapped air must be vented. Consult Deublin for assistance on how best to do this in your application.

Troubleshooting

Problem	Solution
Union temperature seems too high immediately after installation.	Operating temperature may be higher than normal immediately after installing the union, especially if the union is used immediately at high RPMs without media. Generally, it is a good idea to "run in" a new union in order to evenly distribute grease in the bearings. The union will operate correctly without being run in, but it will run hot for a little while.
Union temperature persistently exceeds 50°C (122°F) after run-in.	The seals may be running dry and probably are damaged. This can happen, for example, if air for cleaning the tool taper blows through the spindle and trapped pressure is not released after the tool change. The union should be replaced immediately.
Union makes a loud squeaking or chirping noise at higher RPMs.	
Union makes a loud buzzing or rattling noise at higher RPMs.	The bearings may be damaged. This can happen when the drain hose is blocked or does not have a continuous downward slope. The union should be replaced immediately.
A few milliliters of coolant flow from the drain hose at the beginning of each tool change.	This is normal. Pop-Off™ seals close when coolant pressure is applied and open when pressure is removed. After using through-spindle coolant, media remaining in the spindle and supply hose will drain out from the union. This feature eliminates friction and seal wear during operation without coolant, and allows unlimited "dry running" at any speed.
Coolant flows from the drain hose for several seconds, or more, after coolant pressure is turned on, then stops eventually.	Media pressure and flow are insufficient to close the seals. Media pressure at the union must be at least 1.5 bar to close the seals, with an initial flow of at least 1.5 L/min. Measure media pressure at the coolant supply connection and increase system pressure as necessary.
	Contaminants in the media are jamming the seals and preventing proper closing. Check the filtration system and replace the filter as necessary.
Coolant flows continuously from the drain hose during operation with through-spindle coolant.	The seals have been damaged or have reached the end of their useful life. The union should be replaced immediately.
	Media pressure and flow are insufficient to close the seals. Media pressure at the union must be at least 1.5 bar to close the seals, with a flow of at least 1.5 L/min.

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Problem	Solution
Coolant output at the spindle nose is very low, even with no tool installed and the air channel turned off.	The lance is blocked, due to either a malfunctioning internal check valve, debris trapped in the flow path, or a damaged nozzle. Replace the lance.
	The lance is not fully installed in the union or the lance O-ring is damaged, thereby allowing coolant to escape into the air channel. Remove and reinstall the union and lance.

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Maintenance

The ***DEUBLIN*** 1112-240-001 requires no maintenance after installation. Bearings inside the rotating union are lubricated for life with high-speed, high-temperature spindle grease. Sealing elements are wearing components

1112-240-001 is not field-repairable. Any attempt to disassemble the rotating union voids the warranty. Unions that do not provide sufficiently long life should be returned to ***DEUBLIN*** for examination and analysis.

Warranty

For a period of one year from the date of shipment, ***DEUBLIN*** warrants that the products sold by it are free from defects in materials and workmanship. The liability of ***DEUBLIN*** is expressly limited to the replacement or rebuilding of any article, or part thereof, proven defective, when returned to the ***DEUBLIN*** Company, transportation prepaid, within a reasonable time after termination of the 365-day warranty period.

This warranty is void if the product is dismantled, modified, altered, or damaged from improper maintenance, side loading, excessive temperature, abrasive or chemical action, or other abuse. No representative, agent, or employee of ***DEUBLIN*** has any authority to modify the terms of this warranty. ***DEUBLIN*** will not be responsible for any consequential or resulting damage which may be claimed to have occurred through the sale or use of such products or parts, thereof, which might be defective.

There are no warranties which extend beyond the description contained under this heading, express or implied, including warranties of fitness for a particular purpose.

Important Notice

The ***DEUBLIN*** rotating union is a precision-made piece of equipment and should be handled accordingly. It is a rotating sealing device – not just a plumbing union. Improper use or installation can result in premature leakage or failure. While Deublin unions are of the highest quality and prevision, they are "wear and tear" items. It is important that they are periodically inspected and, as the seals wear out, replaced or repaired to avoid the consequences of leakage.

DEUBLIN unions never should be used for applications other than as specified in the catalog. ***DEUBLIN*** unions should not be used to seal hydrocarbons or other flammable media as leakage may result in explosions or fires. The use of our product on hazardous or corrosive media is strictly forbidden. For applications other than as stated in the catalog, contact the ***DEUBLIN*** Engineering Department for recommendations.

These instructions are provided as general guidelines. They do not contain exhaustive information about the installation, use or maintenance of unions. Purchasers and users of ***DEUBLIN*** unions should be certain that they have reviewed the appropriate ***DEUBLIN*** catalog and have sufficient experience and training in the use of unions before attempting installation or use of ***DEUBLIN*** products. The principal responsibility for the safe and effective use of ***DEUBLIN*** unions rests with the user and its employees. Deublin will provide, upon request, whatever assistance it can to advise users about the use of its products and about any difficulties or problems which are brought to its attention.

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