

Powerful solutions

for your windmill production



Do you need to boost productivity? Invite a yellow coat.

Windmills are fantastic, producing energy from an endless source without waste. Their increasing importance as a power supply is welcomed. Successful windmill producers and their subcontractors around the world face a rapid increase in demand and this might be the reason why you are holding this brochure in your hand. With Sandvik Coromant as your partner, productivity is what we will maximize. Together.

You will find a selection of wind power components with brief descriptions of Sandvik Coromant solutions in this brochure. For deeper information, take a look at our web site www.sandvik.coromant.com/us/wind, or even better – team up with a Sandvik Coromant specialist in a yellow coat!

Connecting rings

A common wind turbine tower is around 300 feet tall and carries a weight of around 80 metric tons of nacelle, rotor and blades. Generally the towers come in tubular steel sections bolted together by six to eight connecting rings – one at each end of the section. The rings are large – usually over 10 feet in diameter.

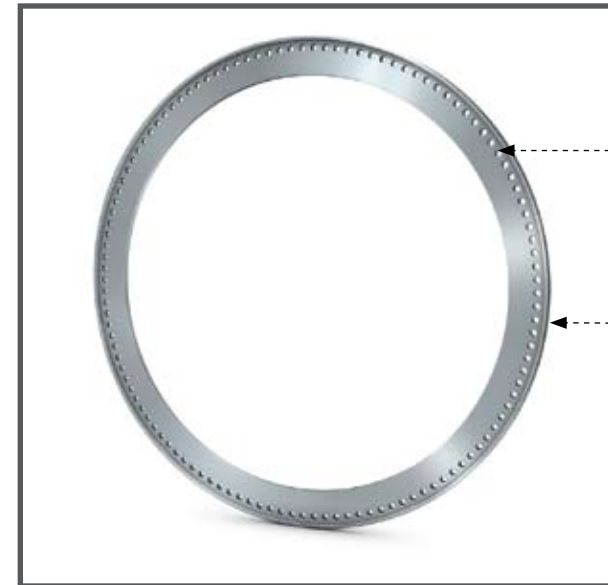
Thousands of such rings are produced in a typical workshop every year. To produce as many rings as possible, speed and accuracy are common challenges. CoroDrill 880 and the new insert generation turning grades make it possible to increase cutting data substantially both in drilling the short holes and in the turning operations.

Drilling

Just by exchanging a conventional drill with a CoroDrill 880, you can double the number of drilled holes in the same amount of time. Its step technology gives outstanding cutting force balance, providing significant improvements in productivity as well as hole quality. This, in combination with high performance grades makes it outstanding when it comes to rapid holemaking.

Turning operations

The T-MAX® P concept encapsulates the contributions of productive turning. The geometries are carefully designed for perfect chip breaking. Metal removal at high feed and in dry conditions is made possible with state-of-the-art grades for your application.



Time saved with CoroDrill® 880

A constant issue for a large connecting ring producer was vibration in the holemaking operation.

A Sandvik Coromant specialist implemented CoroDrill 880 to optimize the process which reduced the vibration substantially and at the same time reduced the cycle time by 35%!

Read more at:
www.sandvik.coromant.com/us/wind



Hubs

The complex shape of the hub makes fixturing difficult and vibration can be an issue. A combination of Coromant Capto® and dampened adapters, Silent Tools®, is a superior productivity solution: Coromant Capto for its stability and Silent Tools to avoid vibration when long tools are required or if the component is vibration-sensitive.

Profiling

Circular interpolation of the large hub bores is possible with the CoroMill® 390 long edge. This tool's large depth of cut capability enables a high metal removal rate and a shorter cycle time for this roughing operation.



Back facing

Machining inside the hub can be difficult and time consuming. A cost efficient solution is back facing with high precision CoroMill® 331.



Face milling

With its light cutting action, eight cutting edges and shims to protect the cutter body, CoroMill® 345 is excellent for every operation - from rough milling of cast surfaces to mirror finishing.



Step and chamfer drilling

With a Tailor Made CoroDrill® 880 step and chamfer drill, two machining sequences are made in one with immediate results in machining time and production cost.

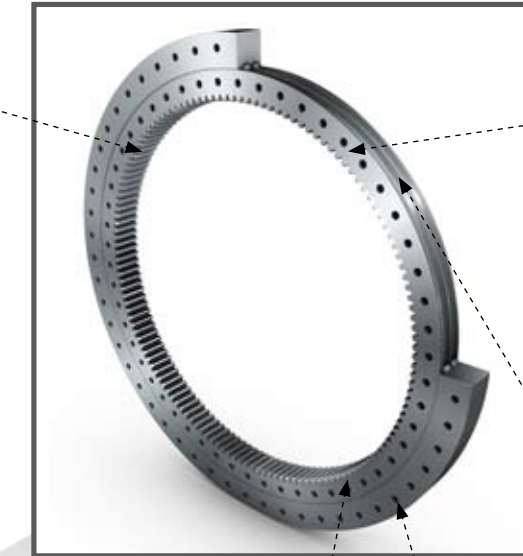


Slewing rings

The slewing ring connects the tower to the nacelle, making it rotate to utilize the direction and speed of the wind. Three smaller slewing rings connect the turbine blades with the hub to adjust the pitch angle of the blades for maximum yield. The forged rings are 6 feet or more in diameter and the most challenging operation in producing them is definitely gear milling. Any inconsistency in the gear milling operation makes grinding more complicated and time consuming. This puts high demands on your gear milling tool.

Gear cutting

Our roughing disc cutter for external and internal gears is equipped with high performance indexable inserts, giving process security and high productivity for your specific gear.



Turning (rough)

Removal of the scale from the forged slewing ring requires secure and tough tooling. Coromant Capto®, CoroTurn® RC and T-Max® P roughing inserts combine to meet these requirements and enhance productivity in this operation.



Grooving

Generating the seal groove on the slewing ring requires a very stable and rigid grooving tool. The CoroCut system features V-shaped or rail design insert pockets with 1 and 2-edged inserts. Grade GC1125 in the CoroCut system is the perfect solution for machining the seal groove.



Drilling

Just by exchanging a conventional drill with a CoroDrill® 880, you can double the number of drilled holes in the same amount of time. Its step technology gives outstanding cutting force balance, providing significant improvements in productivity as well as hole quality. This, in combination with high performance grades makes it outstanding when it comes to rapid holemaking.



Turning (finish)

Finish turning of the slewing ring can be done with Wiper inserts, such as the WMX geometry. This geometry is capable of incredibly high feed rates while maintaining a good and consistent surface finish.

Save time and money with Coromant Capto® tool holding system

The modular system for best precision and stability. Equally effective in turning, milling, drilling and boring. The same cutting units and adapters can be used in different applications and machines, which makes it possible to standardize on one tooling system giving substantial reduction of inventory.



"Running your machine without Coromant Capto is like running your internet without broadband - it works, but it could be so much more efficient."

Main shaft

There are tons of material to remove from the main shaft and highly productive turning solutions generate substantial improvements. From a machining point of view, the forged surface demands inserts with secure performance and high heat resistance due to the long contact times.

Manufacturing deep and precise holes is always a technical challenge, where we are proud to help out. Through 50 years of deep-hole drilling experience, you can feel assured that our tools will do the job. Furthermore, our technical specialists will be there in person to assist you with our solutions.

Heavy turning

Heavy turning of the main shaft forging creates a huge demand on the cutting tool. This heavy turning solution is capable of very large feed rates and cutting depths and includes shim protection. High tech grades like GC4225 provide the perfect combination of edge line toughness and heat protection for high speeds.

Turning, for surface finish and close tolerances:

Try our productivity booster, the WMX wiper, for the finishing operation, where tolerances and surface finish are crucial.

Deep hole drilling

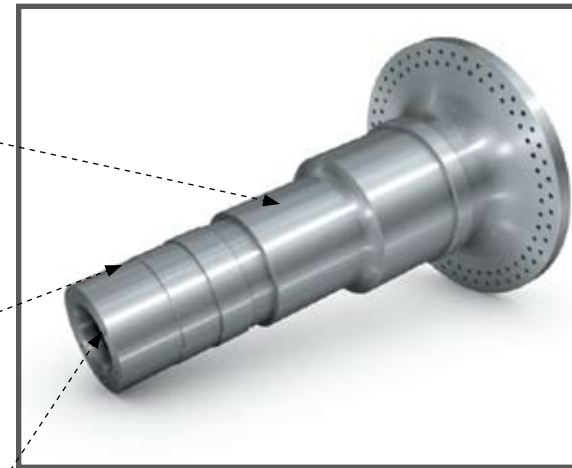
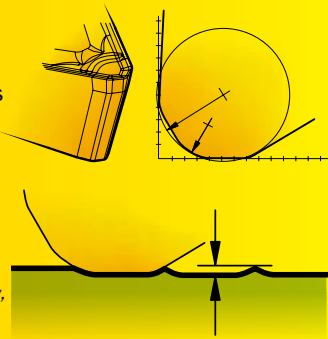
CoroDrill® 800 and T-Max® are indexable drills for excellent hole straightness and surface finish. This is the most productive solution for deep holes tailor made for your diameters.

Wiper technology

The ingenious design of the Sandvik Coromant wiper makes increased feed rates possible with maintained surface quality.

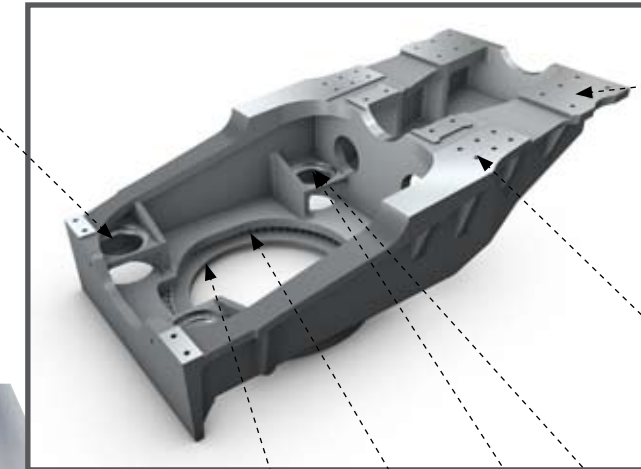
Turning example

For a surface finish of $Ra=40 \mu\text{inch}$ with a .031 inch nose radius insert, a circular shaped nose has a maximum feed rate of .004 inch/rev, while a WMX wiper will keep the surface with a feed rate of .022 inch/rev.



Face and shoulder milling

Versatile, strong, free-cutting shoulder and face mills can drastically cut the cycle time on the main frame. CoroMill® 490-14 has these qualities and is capable of .394 inch depth of cut.



Facemilling

Facemilling of the main frame can be done quickly with the CoroMill® 365. Close-pitched cutters and 8-edged inserts allow for aggressive feed rates and low cost per edge. Available wipers can create a mirror finish on demand.

Drilling

Just by exchanging a conventional drill with a CoroDrill® 880, you can double the number of drilled holes in the same amount of time. Its step technology gives outstanding cutting force balance, providing significant improvements in productivity as well as hole quality. This, in combination with high performance grades makes it outstanding when it comes to rapid holemaking.

Boring (rough)

Maximum metal removal is the goal when rough boring the holes on the main frame. Nothing removes metal from a hole faster than the 3-insert CoroBore® 820.

Back facing

Machining inside the main frame can be difficult and time consuming. A cost efficient solution is back facing with high precision CoroMill® 331.

Boring (finish)

CoroBore® 825 allows for extremely tight hole tolerances and is easy to set up. Combine this technology with dampened Silent Tools® and create the best possible solution for finishing the holes deep inside the main frame.

Profiling

Circular interpolation of the large bores is possible with the CoroMill® 390 long edge. This tool's large depth of cut capability enables a high metal removal rate and a shorter cycle time for this operation.

Vibration-free machining



In a vibration-sensitive application, considerable productivity improvements can be achieved by using Silent Tools. The vibration energy is absorbed into the dampened bar, resulting in minimized vibration and cutting data can be increased substantially. Silent Tools are available for all of your machining applications.

Main frame

This huge nodular cast iron main frame is where the tower connects and where the main shaft, gear box and transformer are fixed in place.

Due to the size, shape and weight, clamping this component can be tricky. Long overhangs lead to risk of vibrations in the milling, boring and drilling operations. Try using light cutting CoroMill® tools in combination with the flexible Coromant Capto holding system. Dampened Silent Tools® adapters are another sophisticated vibration reducer.

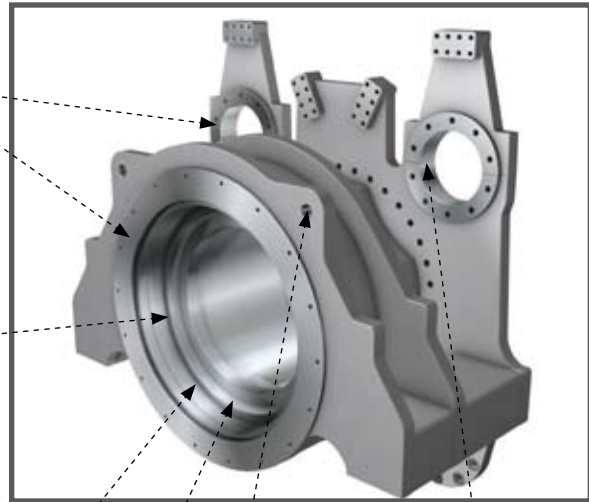


Gearbox housing

The complex shape of the housing makes fixturing difficult and vibration can be an issue. A combination of Coromant Capto® and Silent Tools® dampened adapters creates a superior and stable solution. Build long tool assemblies with Coromant Capto and eliminate the vibrations with Silent Tools.

Facemilling

Rough milling the gearbox housing requires a mill that's both free cutting and strong. With its light cutting action, eight cutting edges and shims to protect the cutter body, CoroMill® 345 is excellent for every operation – from rough milling of cast surfaces to mirror finishing in vibration-sensitive components.



Boring (rough)

Maximum metal removal is the goal when rough boring the gearbox holes. Nothing removes metal from a hole faster than the 3-insert CoroBore® 820. Watch the chips pile up and the cycle time go down.



Roughing the large bores can be effectively completed with the CoroMill® 390 long edge. This solution combines the proven CoroMill® 390 shoulder milling concept with a large depth of cut capability, thereby increasing the metal removal rate and reducing the time needed for this operation.

Boring (finish)

One of the most challenging operations on the gearbox is finishing of large diameter holes. CoroBore® 825 makes it possible with ultra-fine adjustment capability and ease of use.



Back facing

Machining inside the gearbox housing can be difficult and time consuming. A cost efficient solution is back facing with high precision CoroMill® 331.



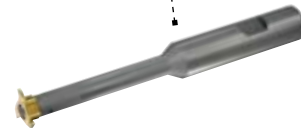
Drilling

One-hit drilling operations that replace two operations or more can have immediate positive effects on the cycle time, and can lower production costs. Tailor Made CoroDrill® 880 step and chamfer drills are designed exactly for this purpose.



Thread milling

Generating internal threads with a threadmill instead of a tap provides improved chip control, lower power consumption and greater process security. CoroMill® 327 is an indexable thread milling solution that provides all of the benefits and the flexibility to address different diameters and pitches.



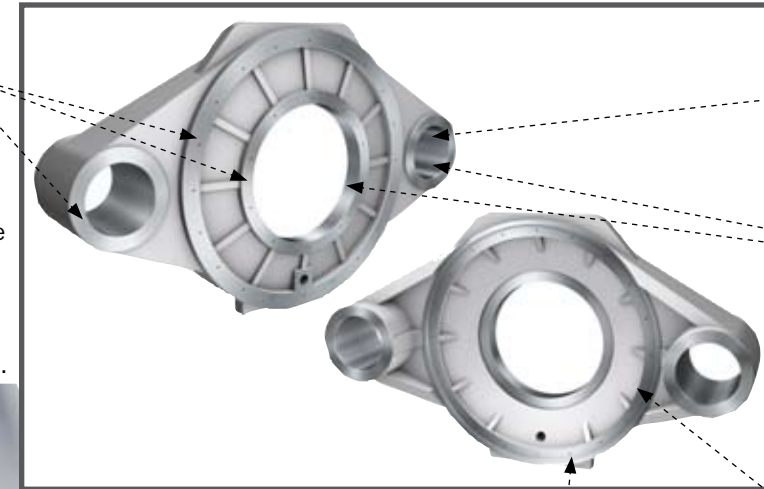
Torque arm

The torque arm is made of nodular cast iron and has the important job of fixing the gearbox to the platform, preventing it from rotating with the main shaft and rotor. The large flat shape makes it challenging to clamp without getting vibrations.

The Coromant Capto holding system is flexible, stable and accurate. It is a proven solution that also allows for a substantial reduction of inventory. Dampened adapters reduce vibrations and increase cutting data. Light cutting CoroMill tools are also excellent at resisting vibration.

Facemilling

Facemilling the torque arm requires a mill that's both free cutting and strong. With its light cutting action, 8 cutting edges and shims to protect the cutter body, CoroMill® 345 is excellent for every operation - from rough milling of cast surfaces to mirror finishing in vibration-sensitive components.



Boring (rough)

Maximum metal removal is the goal when rough boring the holes on the torque arm. Nothing removes metal from a hole faster than the 3-insert CoroBore® 820.



Boring (finish)

One of the most challenging operations is finishing of large diameter holes. CoroBore® 825 makes it possible with ultra-fine adjustment capability and ease of use.



Face and shoulder milling

Versatile, strong, and free cutting face and shoulder mills can come in handy when milling the torque arm. The new CoroMill® 490-14 has these qualities and is capable of .394 inch depth of cut.



Drilling

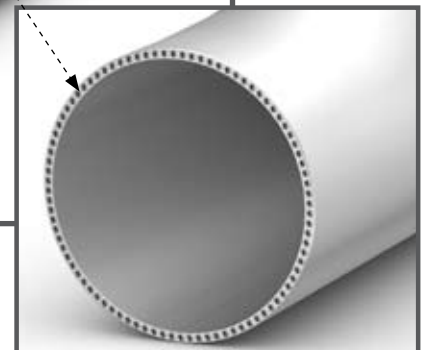
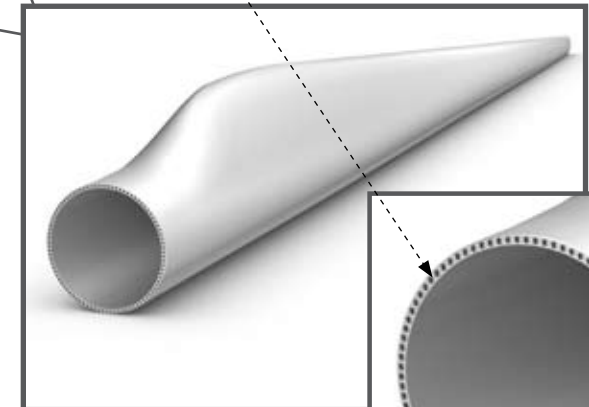
Just by exchanging a conventional drill with a CoroDrill® 880, you can double the number of drilled holes in the same amount of time. Its step technology gives outstanding cutting force balance, providing significant improvements in productivity as well as hole quality. This, in combination with high performance grades makes it outstanding when it comes to rapid hole making.



Rotor blades

The blades are about half the length of the turbine itself which means that they are around 130-200 feet (40-60 meters) long and quite heavy, even though they are usually made of fiberglass.

One challenge is drilling the bushing seats at the end of the blade. In each hole, a threaded steel bushing is glued, so that the blade can be fastened to the hub. There are up to ninety holes on each blade and the challenge is to obtain high quality fiberglass holes. This is possible with the Sandvik Coromant engineered CoroDrill® 880 solution, followed by a trepanning operation with our engineered drill.

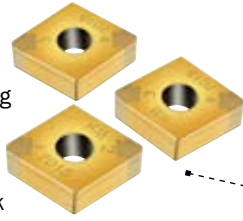


Gearbox shafts

There are a number of different shafts in a gearbox – the sun shaft, planetary shaft, hollow shaft, plus the low and high speed shafts. What they all have in common is that they are steel components with high strength and hardness. Sizes range from 10 inches to 4.3 feet long with diameters ranging from 3 up to 20 inches.

Hard part turning

Finishing of hardened steel with hard part turning instead of grinding can greatly reduce production costs. CB7015 is part of our CBN grade chain aimed at all hardened steel turning applications. Safe-Lok technology provides maximum process security by protecting the brazing from thermal and mechanical stresses.



Turning (rough)

The T-MAX® P concept geometries are carefully designed for perfect chip breaking. Metal removal at high feeds and in dry conditions is made possible with state-of-the-art grades for your application.



Turning (finish)

Try the productivity booster WF wiper for the finishing operation, where tolerances and surface finish are crucial.



Facemilling

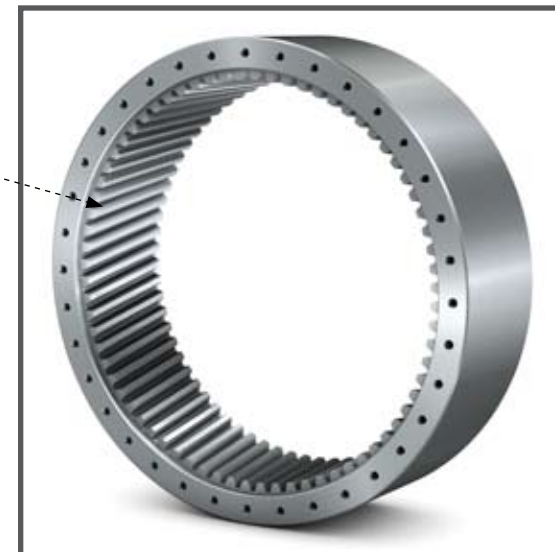
With its light cutting action, 8 cutting edges and shims to protect the cutter body CoroMill® 345 is excellent for every milling operation.



Ring gears

Turbine blades rotate at 10-30 RPMs, but the speed entering the generator is one hundred times higher. One of the answers to that equation is the ring gear. The forged steel ring gear embraces the planetary wheels, allowing them to transform low incoming speed to high outgoing speed.

The rings are 4.3 to 5.9 feet in diameter, the most challenging operation in producing them is milling the gears. Any inconsistency in the gear milling operation makes grinding more complicated and time consuming, putting high demands on the tools.



Gear cutting

Our roughing disc cutter for external and internal gears is equipped with high performance indexable inserts, giving process security and high productivity for your specific gear.

Planetary carriers

The planetary carrier connects the gearbox with the main shaft and holds the planetary wheel and sun shaft. Machining this nodular cast iron component is about accuracy in every operation; from turning and milling to boring and drilling. Around fifty tool assemblies are involved in the production, which means that it takes almost a whole shift to produce one of these.

Boring precision holes with long overhangs with risk for vibration is one of the most challenging operations. The flexible Coromant Capto® holding system provides precision and stability, and allows for a substantial reduction of inventory. Silent Tools® dampened adapters can reduce vibrations and allow for increased cutting data.



Rough boring

A series of holes on the planetary carrier can be roughed quickly with a boring tool. Nothing removes metal from a hole faster than the 3 insert CoroBore® 820. Watch the chips pile up and the cycle time go down.



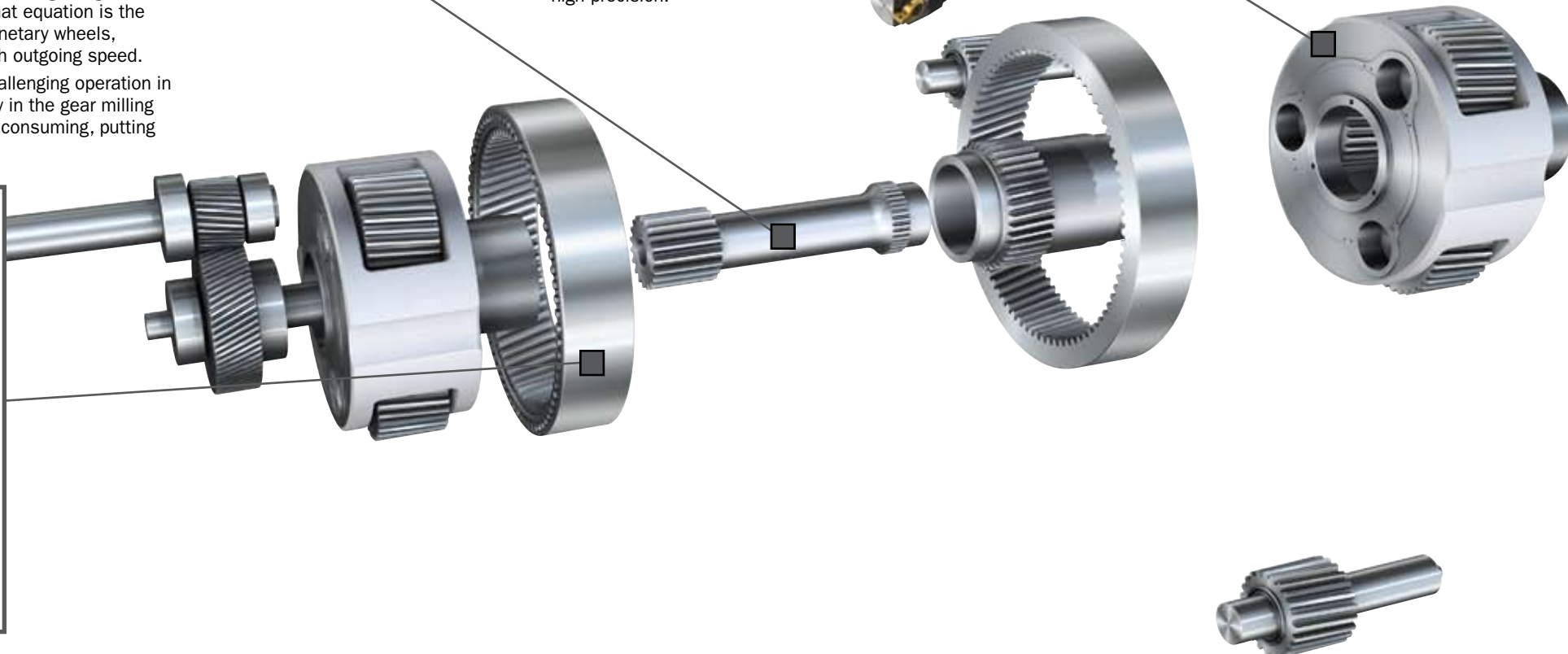
Helical interpolation

Helical interpolation is a flexible 3-axis ramping technique. With CoroMill® 390, it becomes a truly efficient rough boring alternative.



Fine boring

Use CoroBore® 825 for the finishing operation. It is versatile and easy to use, with micrometrical adjustments for high precision.



As a Sandvik Coromant customer you also benefit from:



A network of over 5000 specialists

The Sandvik Coromant yellow coat is more than a quality guarantee. It's also our promise that there will always be a specialist nearby who understands your production, business and industry.



Latest tool technology

We put more money and effort into R&D than any other cutting tool manufacturer. With over 2,500 new items introduced annually, you have access to the latest metal cutting technology.



Quick deliveries

24 hour delivery of tools all over the world to keep your inventory down and to make sure you get the tools when you need them.



Training

Over 20 well-equipped Productivity Centers around the world, ready to offer you hands-on solutions to increase productivity. Training at your production facility is also an option.



Application knowledge

Our tools are world leaders, but it is the application knowledge that makes us truly unique. In our Application Centers around the world, we develop pioneering solutions together with you.



Measurable results, right from the start!

It's not the top line; it's the bottom line that counts. We offer various cost reduction programs to help you achieve savings for both existing and new machinery.



... and a simple procedure for environmental savings

We take full responsibility for our inserts throughout their entire life cycle. We've developed a simple worldwide recycling concept to make it easy for you to recycle used inserts. Sandvik Coromant provides collection and transport boxes. The inserts are sent to our central recycling plant.



For more information:

1-800-SANDVIK (1-800-726-3845)

www.sandvik.coromant.com/us/wind

