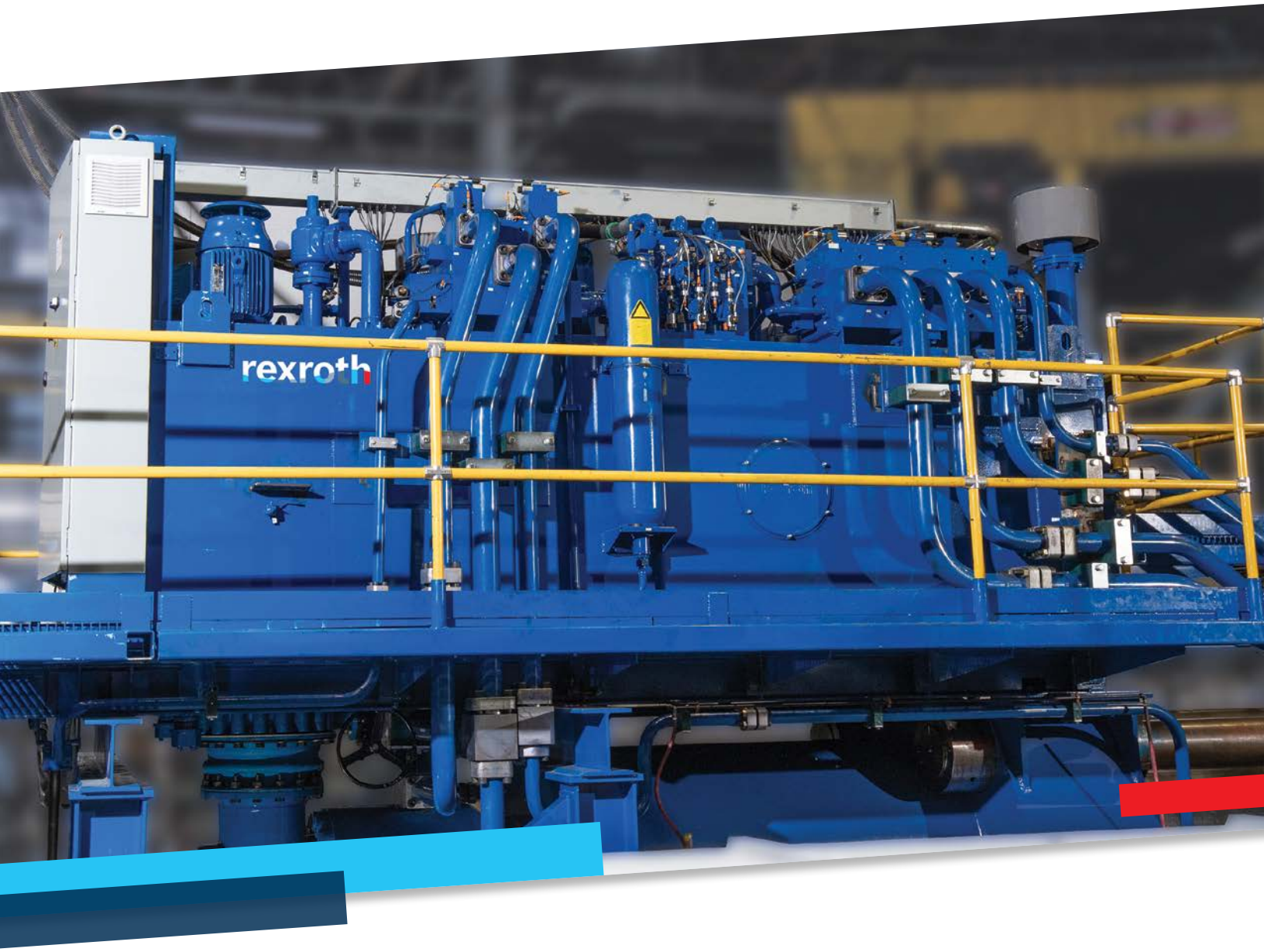
CASE STUDY

rexroth
A Bosch Company



How Rexroth Gave Keymark's 50-Year-Old Aluminum Extrusion Press a Modern Overhaul

Keymark Corporation, established in 1964, is a leading aluminum extrusion manufacturer, creating a variety of custom and standard extrusions, as well as other value-added aluminum products, for an array of U.S. industries.

Keymark's factory in Fonda, New York, contains four extrusion lines, where aluminum billets are heated to around 900 degrees Fahrenheit, then pressed through dies into a variety of custom shapes, such as angles or flat bars. The presses are kept running 24 hours a day, 365 days a year.

Images of the system before modernization, showing obsolete legacy components and complex piping.

Keymark's 8-inch press was installed in 1971 and had been in service for more than 50 years when the company decided to begin exploring options for upgrading or replacing the unit. By 2021, the press was experiencing a high breakdown rate, resulting in frequent lost production time. Among other ongoing issues, the side walls of its container shifting cylinders were scored and leaking, making it difficult to hold the necessary level of pressure.

Other than a few minor upgrades, the press still had many of its original parts from 1971. Because new replacement parts for the press were no longer available, Keymark was forced to buy used parts or send its broken ones out to be refurbished, a process that often took days or weeks. The press's operational integrity was becoming a concern as the likelihood increased that a future breakdown would be very challenging and difficult to fix, leading to prolonged downtime.

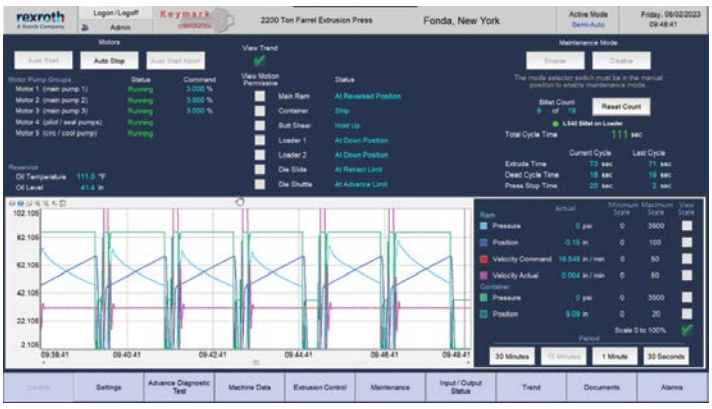
"You could probably call those pumps the heart of the system," said Mike Kramer of Rexroth.

As one of the top names in hydraulics worldwide and a manufacturer of many of the components used in aluminum extrusion presses, Rexroth was a natural choice to perform this major upgrade project. Rexroth initially presented Keymark a range of options, from minor upgrades (changing pumps, upgrading manifolds) to a complete hydraulic and control modernization. In the course of discussion, Keymark ultimately opted to leave the bones of its original press from 1971 — including its front and rear platens, its main ram housing and its tie rods — but have Rexroth replace the entire hydraulic power unit, electrical controls, prefill valve, transducers and piping.

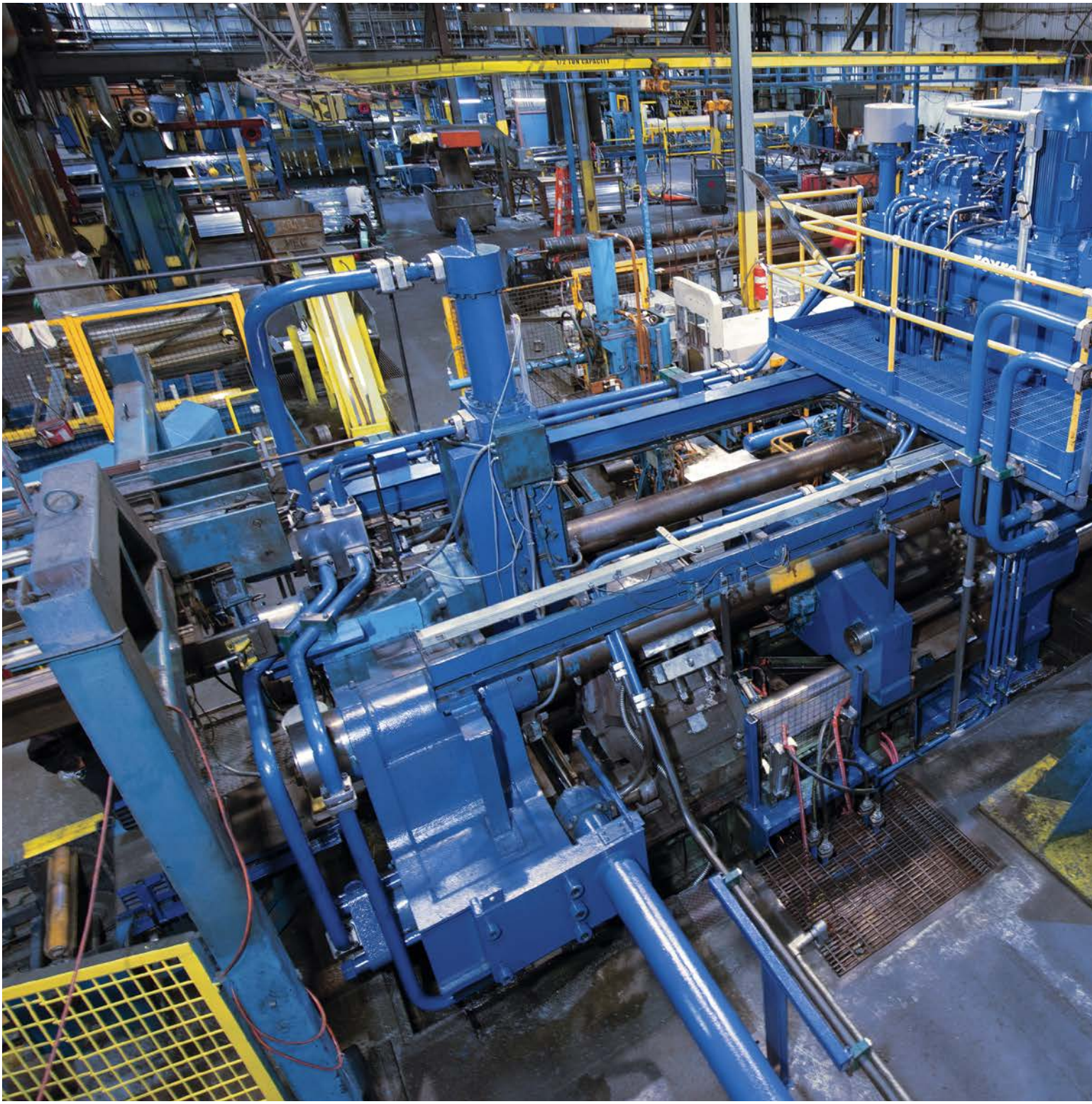
The new power unit, built at Rexroth's factory in Bethlehem, Pennsylvania, included a roughly 3,000-gallon steel tank, three 200-hp electric motors with three A4VSO axial piston pumps and custom manifolds.

"You could probably call those pumps the heart of the system," said Mike Kramer of Rexroth. "They have a long, proven track record."

The electronic control system uses Rexroth's extensive knowledge of how to manage pressure within a system, resulting in the fastest, smoothest possible operation. Keymark opted for Rexroth's Advanced Diagnostics troubleshooting package, which utilizes a collection of embedded sensors to monitor the system at all times. Using a touchscreen, users can go through individual areas step by step to discover where failures have occurred. This significantly shortens the time needed to identify a problem, from several hours to as quickly as a few minutes.



The main control screen offers real-time performance data display, status of critical parameters, and intuitive navigation to all other control system function screens.



The new system included a pre-manufactured and painted, non-welded piping system that minimized installation time.

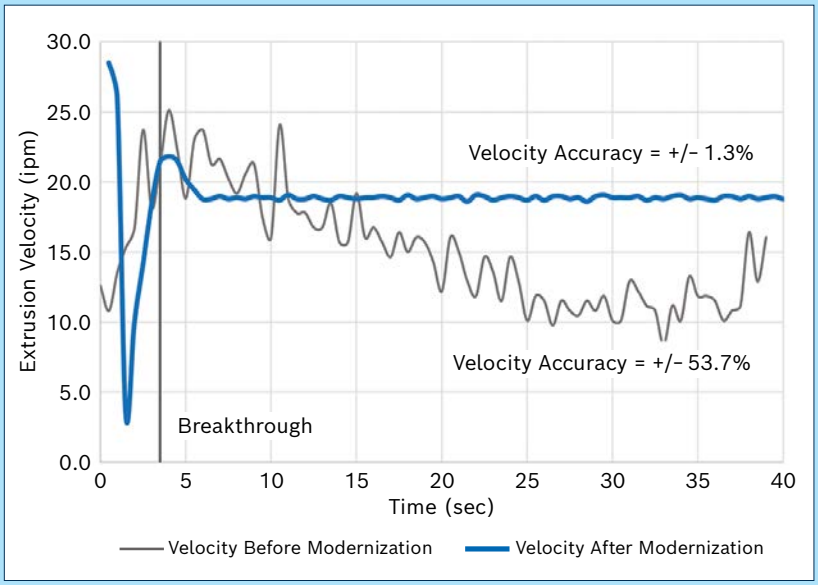
"We've really found it useful on the mechanical side for troubleshooting issues and for testing. We can force valves different directions if we want. We can see pressures everywhere — where we're spiking, where we're not spiking," said Shawn Gavin, manager of Keymark's plant. "It's just made a world of difference as far as the troubleshooting goes. I definitely would highly recommend it to anyone getting an upgrade."

In addition, Rexroth did 3D laser modeling of the entire press and used it to engineer the new piping system. Every new piece of pipe used throughout the system comes with a part number, making repair and replacement significantly easier. After construction and internal testing, the power unit was transported to Fonda, New York, for installation in May 2023. Keymark had removed its old equipment and, with Rexroth's assistance, managed the delicate installation of the new power unit.

The unit, weighing 50,000 pounds, needed to be moved with cranes into place over the press, sitting in a specific location so all the pipes would line up perfectly. Before the installation, Rexroth met with contractors on the project and shared all the necessary specifications to ensure the process would go smoothly. A team of Rexroth technicians, control engineers, and hydraulic engineers then spent three weeks on site at Keymark overseeing the final install and getting the new unit into production.

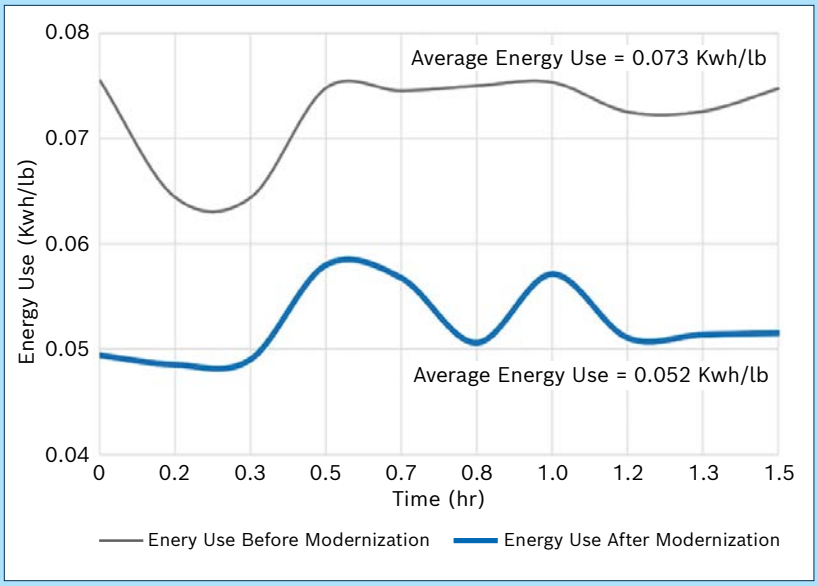
The power unit had to be carefully rigged into position above existing equipment.

Velocity Control Before / After Modernization



The new system greatly improved extrusion velocity control, improving quality and reducing scrap rates.

Energy Use Before / After Modernization



A 28% reduction in energy use (on a pounds per hour basis) was realized, saving about $25,000/year.

Since going online in June, the upgraded press has shown a dramatic improvement in performance and reduction in downtime. The press's dead cycle time — the time between when it finishes its last extrusion to when it starts the next extrusion cycle — used to be between 28 and 29 seconds "on a good day," Gavin says. Now, it's an average of 20 to 21 seconds. The 8-inch press is now even outproducing an older 9-inch press at the same factory.

In the aluminum extrusion industry, even a few seconds' improvement can add up to a significant increase in production. If the press runs 300 aluminum billets during a typical shift, a two-second dead cycle improvement adds up to 600 seconds, or 10 minutes. Over two shifts 365 days a year, that's 7,300 minutes saved — more than five days of additional production per year.

Another benefit of the new Rexroth system is greatly improved extrusion velocity control. The speed at which the product is extruded is critical to the quality of the parts being produced, because a constant velocity during extrusion has a direct influence on surface finish, tolerances, and material properties. However, many older systems are not able to accurately control the speed because of the varying dynamics inherent in the process. The top graph to the left shows the dramatic improvement in extrusion velocity control provided by the new Rexroth system. The grey line (before the modernization) shows the velocity varying over 50% while the new system (blue line) is constant, varying only 1.3% throughout the cycle. This improved level of control will help reduce scrap rates and may allow a press to make higher-value automotive or aerospace parts that it was not capable of in the past.

Gavin says the improvement in energy efficiency is dramatic. Whereas the old system would run all motors simultaneously during an extrusion cycle, the new unit only runs its three motors during the dead cycle time, then drops down to one during the extrusion cycle as the other two idle. After each billet, the control "cascades"

The modernization provided a 20% productivity increase while improving quality and reliability and reducing energy use.

to another motor for the next billet, which helps extend the pump and motor lifespans by equalizing the work. In addition, the electric motors, pumps and valves are all much more efficient than the worn-out legacy components they replaced. The end result is a 28% average energy use reduction as shown in the bottom graph to the left.

Not only does the upgraded design make the press much more efficient and easier to control than it used to be, any replacement parts that are eventually needed will be more readily available and much less expensive, saving Keymark tens of thousands of dollars.

"I have to say that they did nail it, they really did," Gavin said. "I'm very pleased with how the press is running and operating, the consistency of the cycles. It's just been a night-and-day difference."

In the months after installation, Rexroth technicians returned to Keymark regularly to correct bugs and small issues. In addition to the on-site training they've already received, Keymark employees travelled to Rexroth for an additional PLC training course.

"They were really willing to listen to us, to come back up and fix any and all issues with the press we were having. That, to me — you just don't see that anymore," Gavin says.

With improved efficiency, fine-tuned controls, an intuitive troubleshooting system and easily replaceable high-quality components, Gavin says the difference between Keymark's original press and its upgraded version is vast.

"It's like going from a 1970 Volkswagen to a Cadillac," he says.

Bosch Rexroth Corporation
14001 South Lakes Drive
Charlotte, NC 28273
Telephone: (800) REXROTH
(800) 739-7684
info@boschrexroth-us.com
www.boschrexroth-us.com

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