



**Four Essentials To**

**Boosting Productivity**

**in Factory Automation**

**Production Lines**

**rexroth**  
A Bosch Company

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**Today’s factory automation systems are achieving new milestones in sophistication, versatility, efficiency and performance.**

Across every major industry segment, the application of advanced digital technologies and Industry 4.0 capabilities offers manufacturers powerful new capabilities to enable flexible production, improved product quality and real-time insight into the performance of their operations.

However, these factories and production lines aren’t built by themselves. Designing, engineering and building these advanced systems demand intense investment in time, resources and know-how to

solve some of the world’s most complex technology challenges.

Increasingly, end-user manufacturers need more automated and innovative solutions, and automation OEMs and system integrators seek experienced partners to solve these challenges. They want to dramatically shorten the time and effort it takes to bring new production systems online or update existing lines with more versatile and efficient technology.



# Key challenges to advancing automation productivity

Advances in technology typically offer greater flexibility or increased ease of use. However, with factory automation, the newest technology has, in some ways, created greater complexity. As manufacturers, automation OEMs and integrators seek to improve productivity and performance, they face several key challenges.

## Proprietary protocols create barriers and limitations

Many manufacturers are locked into proprietary automation programming platforms and control architectures. This can limit their ability to rapidly create or modify production lines and processes in response to changing market conditions or to take advantage of new technologies.

Machine builders want to create applications and functions for different-sized systems without having to start from scratch. To do so, hardware and software that are both open and highly interchangeable are ideal. One machine module can be designed independently from another, with two separate controls running completely different apps. Yet, the whole machine works in harmony because the underlying automation platform is connected, scalable and open.

Proprietary protocols also complicate efforts to achieve seamless data exchange and integration in automation systems. Data-driven decision-making leveraging real-time data and analytical tools is hampered by incompatible communications and data-formatting techniques. To compensate, automation OEMs and end users are forced to build software bridges or implement time-consuming data management workarounds.





## Complexity of automation

### specifications and commissioning

Until recently, it could take 18 months to two years for new automation systems to go from initial design to final commissioning and full operation. That kind of schedule limits manufacturers' ability to be competitive, meet consumer demands and earn returns on their automation investments.

Instead, they are calling for technology with more intuitive software that is much easier to program and commission. They also need hardware – production system components like electronic cabling, conveyors, linear modules and other types of products – engineered to *simplify* machine and production line assembly. The goal: condense construction from months to weeks – or even less.

Machine builders also seek more powerful digital design tools and resources from technology providers to help remove complexity from engineering processes and help speed product selection, ordering and integration.

## Access to high-quality,

### innovative technology

Automation end users and OEMs seek partners who offer innovative technology that is engineered for long-lasting, reliable performance, helping minimize maintenance costs and deliver superior total cost of ownership.

They need more than just access to cutting-edge hardware or software. They want to work with technology providers who have proven engineering expertise and successful projects already delivering value in relevant applications. Real expertise, along with the right technology, is often the decisive factor in building effective automation partnerships.

Ultimately, what OEMs and manufacturers face are challenges, goals, budgets and timelines to get the job done. What they value most are partners who can analyze those challenges and pull together the most productive solution – “Based on your challenges, here’s how we can solve it for you.”







## Complete solutions:

### The way factory automation should be

With the industry's broadest automation portfolio, Bosch Rexroth provides automation solutions that go beyond advanced components, to include innovative engineering and customized support. We give manufacturers and machine-builder OEMs solutions that target their unique challenges and enable them to get to market faster.

We combine digital engineering tools and decades of expertise to provide advanced solutions, from initial system design to implementation and full lifecycle support. Thousands of manufacturers in every major industry count on the cross-technology solutions we deliver – smarter, faster, more open and customizable production systems engineered to provide the precise blend of quality, flexibility and performance each automation challenge demands.

**We combine digital engineering tools and decades of expertise to provide advanced solutions, from initial system design to implementation and full lifecycle support.**



## Four essentials to boost productivity

**At Bosch Rexroth, we provide four essential capabilities to boost factory automation productivity, versatility and manufacturing performance:**

### Expertise

Industry-specific, application-driven solutions



### Freedom and openness

Technology harmonized to support customization and easy integration



### Speed to market

Making it easier to develop and deploy new machines faster

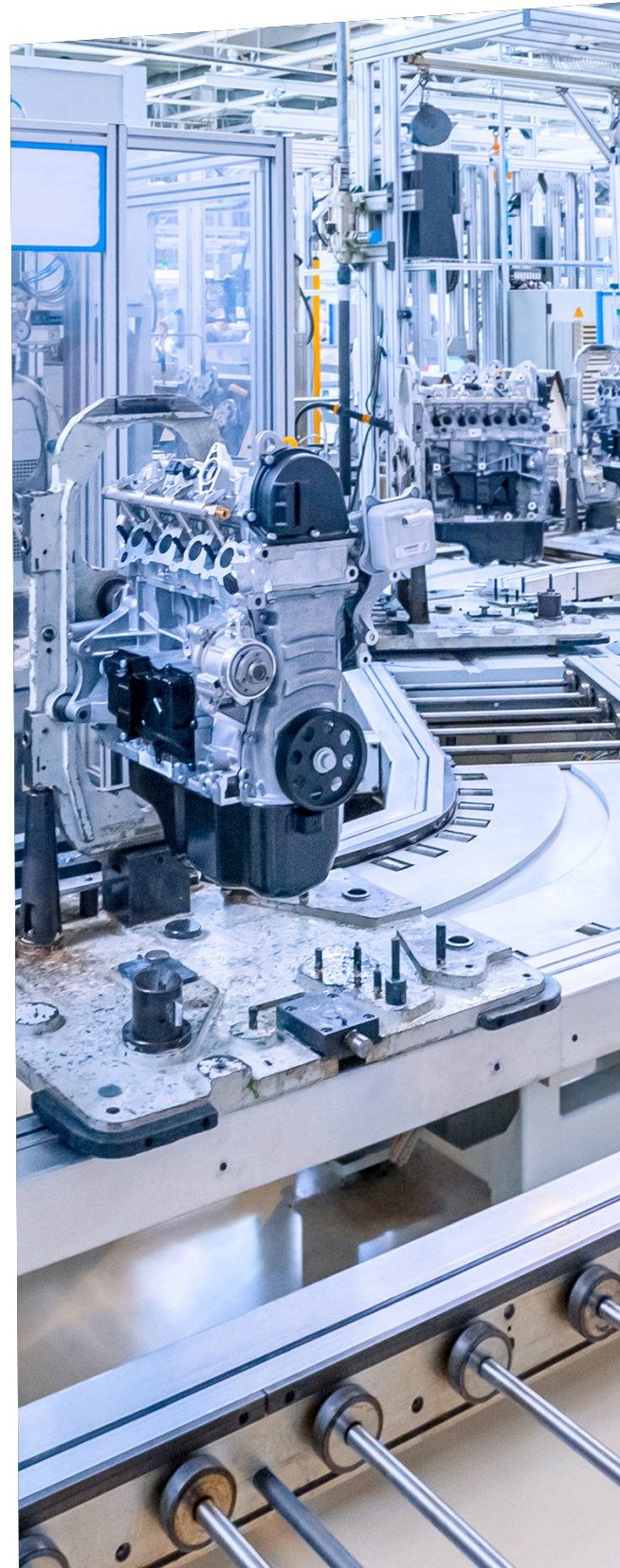


### Full lifecycle support

Complete solutions across the full system lifecycle



We draw on these capabilities with each automation challenge we face, blending and balancing these essentials based on what the manufacturer identifies as the key elements that will maximize how to move their automation systems forward and achieve their business goals.







## Expertise:

### Industry-specific, application-driven solutions

One of the most significant ways Bosch Rexroth can help boost factory automation productivity is by applying the expertise and insight we've earned helping create thousands of automated production systems in every major industry segment. Few other companies across the globe can match our experience: over 225 years providing production technology and engineering insight and support to manufacturers, literally since the start of the Industrial Revolution.

In many cases, these factory automation solutions are complex, cross-technology platforms that incorporate multiple controls, drives, electric motors, material transport, linear motion and other systems. Bosch Rexroth has deep expertise in every key step developing these solutions, from initial design, component and system selection through commissioning and ongoing lifecycle support.

In addition, as a major manufacturer of a wide range of technology products, we apply our expertise to constantly improve our own production systems in plants across the globe. This includes not only the manufacture of factory automation technology such as controllers, drives and conveyors; it also includes Bosch Rexroth's production of advanced industrial hydraulics and mobile machine hydraulic systems.

**A key part of our experience has been developing strong, working partnerships with leading machine builder OEMs and systems integrators in printing and converting, electronics manufacturing, automotive, consumer packaged goods and other automation-intensive industries.**



## Our expertise covers the full range of factory tools and automation challenges:

### Complete production line


Working in tight partnership with a global provider of engineered-to-order precision automation solutions, Bosch Rexroth and DWFritz Automation created a complex, automated battery production line for a leading North American battery manufacturer. The project drew from the full range of our factory automation portfolio – controls, drives, linear technology, conveyors and more – and was completed in record time, taking weeks to complete a project that would typically require months.

### Major controls upgrade

For an industry leader in vertical form, fill and seal machines, we provided a major upgrade to their automation controllers, servo drives, motors and safety control. These upgrades improved packaging efficiency and productivity, extended the lifecycle of existing machine designs and continue to provide 24/7 global engineering and technical support for the company's customers in multiple regions.

### New pressing tools

For a manufacturer of specialty sensors, we provided multiple Smart Function Kit for Pressing systems to enable the rapid production of small batches of sensors economically, with exact joining and pressing processes and automated capture of quality process data.



More and more frequently, automation solutions are being created using an approach that Bosch Rexroth specializes in: concurrent engineering, with system design, programming and component acquisition and integration organized to occur in tight, overlapping time frames.

As both a technology provider and a company with centuries of engineering experience, we are uniquely positioned to apply our expertise to objectively assess and identify the optimum set of components and systems from our portfolio to create the right automation solution.





## Freedom and openness:

# Technology engineered to support customization

No two manufacturing solutions can ever be the same – whether it's electric vehicle battery pack assembly or high-speed consumer good packaging lines, automation OEMs want to rapidly supply systems to their customers that fit very specific requirements.



To do so, they seek automation technology portfolios – software and hardware, individual components and complete systems – inherently engineered to add options and flexibility. This overcomes the limitations that proprietary protocols or system designs impose – particularly in automation controllers and controls solutions that have dominated the industry in the past.

Bosch Rexroth's ctrlX AUTOMATION is an automation platform engineered from the ground up to be more open and flexible than any previous solution. Users enjoy maximum flexibility thanks to a full range of software and programming tools, an extensive portfolio of high-performance function libraries and building blocks for common automation tasks. This helps simplify the complex challenge many manufacturers face harmonizing all the different production, material transport and handling systems into a single, fully integrated and finely tuned manufacturing solution.

In addition, users can develop their own applications in any programming language – ranging from IEC61131, PLCopen and G-code to C/C#, Python, Java and more. The ctrlX CORE automation control supports easy connectivity through open communications protocols such as Ethernet-based EtherCAT architectures as well as emerging standards like OPC.



## ctrlX AUTOMATION: Automation without limits

ctrlX AUTOMATION eliminates the classic boundaries between machine controls, the IT world and the Internet of Things to move manufacturing automation two steps ahead. Revolutionizing how the industry approaches automation platforms by making automation as easy to use as a smartphone, it offers:

- **A Linux real-time operating system**
- **App programming technology**
- **Consistent open standards**
- **Web-based engineering**
- **A comprehensive IoT connection**



This openness lets OEMs and end users implement automation platforms tailored to specific product manufacturing, throughput and versatility requirements. Prior generations of controllers from some suppliers would force automation OEMs to integrate more complex costly controllers than was needed for a given machine axis so that they could use that controller across the whole machine.

Controllers from ctrlX AUTOMATION can be scaled with additional apps so that, instead of having many different controllers with hardware-defined functionality, the core architecture lets the OEM scale as needed. This openness also helps manufacturers add new machines to existing production lines using proprietary interfaces, with app-based software bridges to simplify integration.

### Customization is more than just a controls capability

Bosch Rexroth's broad automation portfolio features multiple technologies designed to maximize how OEMs and end users engineer solutions to meet production-specific requirements.

For example, Bosch Rexroth offers multiple material transport and conveyor systems with a range of speed and load capabilities to suit many different production applications. Bosch Rexroth conveyors and transport systems are modular platforms designed for rapid design, configuration and installation.

From transfer systems for rapidly moving products weighing a few grams to linear motor-driven systems that can precisely transport up to over 400 kg, our transport systems maximize efficient use of valuable factory floor space. Their modularity speeds up planning and allows manufacturers and system integrators to easily upgrade or modify existing systems.

Bosch Rexroth also offers more choices for movement within machines, with a complete range of linear motion technology solutions. From simple components to new, smart mechatronic solutions, we provide more linear module options, so machine builders aren't forced to compromise their system designs and are able to meet the exact end user specifications.

**We provide more linear module options, so machine builders aren't forced to compromise their system designs.**

incorporates physical and electronic interfaces that make it easier to integrate our components into any machine design.

When machine designers and end users have this kind of open, flexible technology that expands their system design options, they are free to build automation solutions that have the highest levels of performance and productivity engineered in from the start.



### Conveyors and material transport: Scalable solutions

Moving high quantities with short cycle times? Producing small batches with high variation? Bosch Rexroth conveyors and transport systems combine innovation with efficiency and flexibility. With ActiveMover, VarioFlow *plus* and TS conveyors, we offer:

- **Efficient motors plus modular designs that help prevent overdimensioning and energy loss**
- **Robust components and innovative technology that ensure high reliability at low maintenance costs**
- **Linear motor-based transport systems that support ultraprecise endpoints and accelerations up to 4 g**
- **Consistent modular design combined with our MTpro tool that speeds up planning and allows easy upgrades**





## Speed to market:

# Developing and deploying new systems faster

Incorporating more innovative, sophisticated technology into new or existing production lines is only part of a complete automation solution. Manufacturers want to put that automation technology to work as fast as possible, to speed up their return on investment and rapidly reap the benefits of improved productivity and manufacturing performance.

The key is to have technologies that, while sophisticated and cutting-edge, simplify and streamline the time, effort and resources it takes to put them to use in existing or new manufacturing facilities. With ctrlX AUTOMATION, Bosch Rexroth has a paradigm-shifting “smartphone of automation” approach to programming automation platforms that provides that simplicity.

As part of the ctrlX AUTOMATION platform, Bosch Rexroth has created the ctrlX Store, offering automation apps from Bosch Rexroth and third-party providers as well as applications and libraries for individual app creation. Using an app-based approach can help speed the development of complex applications like delta robots or vision inspection systems. With an app-based approach, these functions can be downloaded and added to the automation platform, tested and integrated into the system hardware much faster, with less risk of error and rework.

One of the other barriers to improving speed to market is the need for automation OEMs to select and integrate multiple technologies – linear modules, drives, controls and other components – into stand-alone electromechanical systems, or mechatronics, for manufacturing applications such as joining, pressing and handling systems.

**The Smart MechatroniX family of “plug and produce” mechatronics systems makes it simple and fast to select, order and start using these tools.**

select, order and start operating, using a range of manufacturing and material-handling tools with sophisticated performance and IoT capabilities.

Linear robots are widely used material handling systems that

To meet this need, Bosch Rexroth has created the Smart MechatroniX family of “plug and produce” mechatronic systems that makes it simple to



## Smart MechatroniX: Plug-and-produce platforms

Bosch Rexroth advances plug-and-produce manufacturing solutions with Smart MechatroniX. Combining proven linear motion components with smart, easy-to-program controls and simplified commissioning and integration, Smart MechatroniX offers unique advantages to our complete automation solutions, like:

- Accelerated engineering, commissioning and time to market
- More transparent, efficient and reliable production
- High operating performance and sustainability through permanent updating



transfer products or packages from one part of a production line to another. With the Smart Function Kit (SFK) for Handling – part of the Smart MechatroniX portfolio – machine builders use Bosch Rexroth’s online LinSelect tool to quickly size and select all the linear robot components in a single operation. The linear modules, motion controller, drives and motors, cabling and end effectors for a complete linear robotic handling solution are ordered and delivered as a single product, with a CAD model provided as a “digital twin.”

SFK for Handling features commissioning software with drag-and-drop motion sequences pre-configured for a range of common pick-and-place functions. The software gives operators simple, intuitive tools to modify sequences or add new ones as needed; it also has i4.0 data capture and analysis capabilities to track the linear robot’s performance.

Even the simplest production line systems can add flexibility and help streamline efforts to bring new manufacturing systems online. Aluminum structural framing from Bosch Rexroth is a perfect example: With the widest

range of profiles, connections and accessories in the industry, machine enclosures, worktables, flow racks and material shuttles can be snapped together with a minimum of effort and without specialized personnel or tools.

To make its use even easier, Bosch Rexroth’s MTpro software is a sophisticated, user-friendly platform that can speed selection, configuration, layout and ordering of assembly technology products. All the framing products are included in a digital library, which can be drag-and-dropped and “mated” so that all the components have their positional relationships correctly drawn in 3D CAD models. Once the design is complete, the system generates a single bill of materials to simplify ordering.

All of these capabilities have been developed to overcome the obstacles that have slowed the creation of automation solutions, replacing complexity with more streamlined technology to meet a critical automation goal: faster time to market.





## Full lifecycle support:

### Complete solutions for the long haul

An automation solution isn't complete when it's delivered, or when the "start" button is pressed for the first time. Full lifecycle support is an essential requirement for any truly complete automation solution: Manufacturers and their OEM machine builder partners have a right to expect that technology providers will have resources ready to support their systems and help make certain that targeted performance and productivity goals are sustained.

At Bosch Rexroth, we incorporate sensors and other technology into our solutions to continually gather critical system performance data – not only for the end user, but also to provide real-world insight into the lifecycle performance of our systems.

Our expert service organizations and predictive maintenance tools, supported by remote access capabilities, give us powerful tools to stay ahead of performance issues. We also staff our online live technical support with engineers, in addition

to customer service personnel, to provide the exact level of support needed in real time. And we offer a full range of training programs, at system launch and on an ongoing basis, to keep a manufacturer's plant personnel fully up to date.

Remoting is also a key element of the way we keep software platforms like our ctrlX AUTOMATION products up to date, following the standard software update models now common for laptops, smartphones and IT platforms.

These and other lifecycle service and support programs are not afterthoughts tacked onto our technology products – they are integral to the value we offer. Through our service and support programs, we make sure end users know how they will be supported, how parts and service personnel can be made rapidly available and how we will respond (with global resources) to help maximize manufacturing uptime and productivity.



## Conclusion:

# Focus on what moves automation forward

Boosting factory automation productivity and performance calls for more than just great products – it needs smart, open, customizable technology harmonized at every level to work with seamless efficiency and built-in flexibility. Every automation challenge – either for new production lines or as add-ons or upgrades to existing platforms – requires unique solutions.

These solutions are ultimately defined by what the manufacturer identifies as the most critical elements that will maximize the success and long-term growth of their business. At Bosch Rexroth, our complete automation solutions target the complexities and obstacles manufacturing faces, expanding productivity so manufacturers gain the advantages they seek to get to market faster.

With more than 225 years of engineering expertise, Bosch Rexroth streamlines how automation works, with solutions that are application-driven, results-focused and service-oriented. By combining our industry-leading technology portfolio with advanced engineering tools and decades of automation project experience, we help advance the performance and value of automation across the industry by offering:



**Proven expertise to bring it all together**



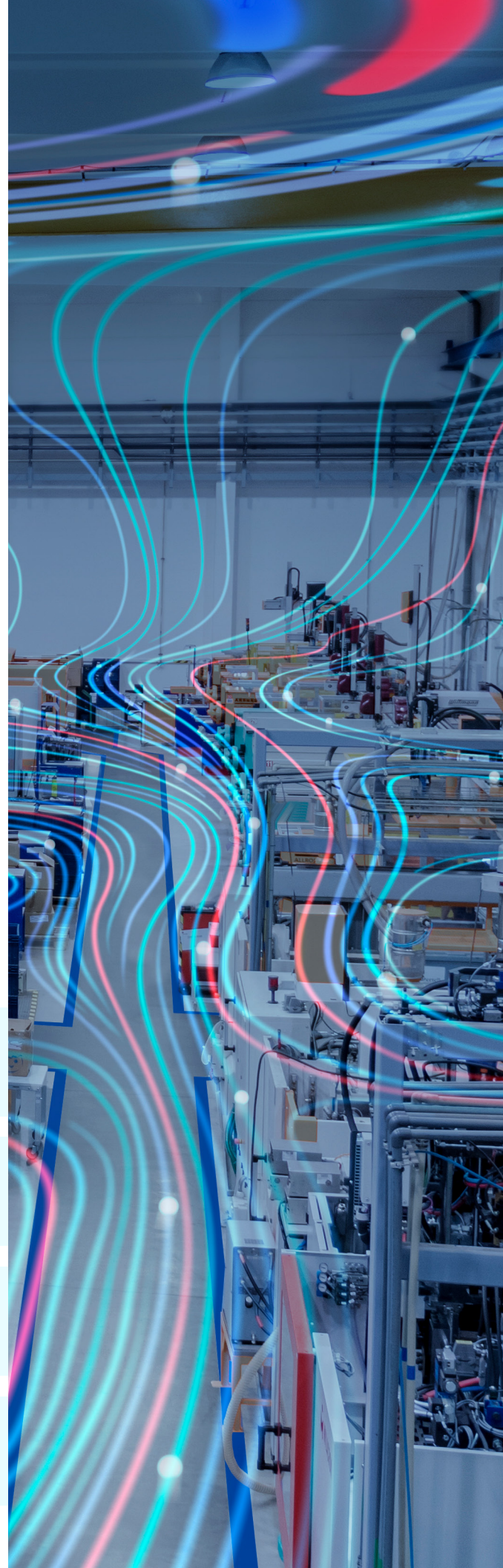
**Faster time to market**



**Open technology engineered for easier customization**



**Value-added integration of full lifecycle support capabilities**



Do you need expert insight on  
complete automation solution design,  
implementation and lifecycle support?

**Bosch Rexroth automation  
experts are determined to help  
you solve your most intricate  
engineering challenges.**

**Contact us**

**today.**

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