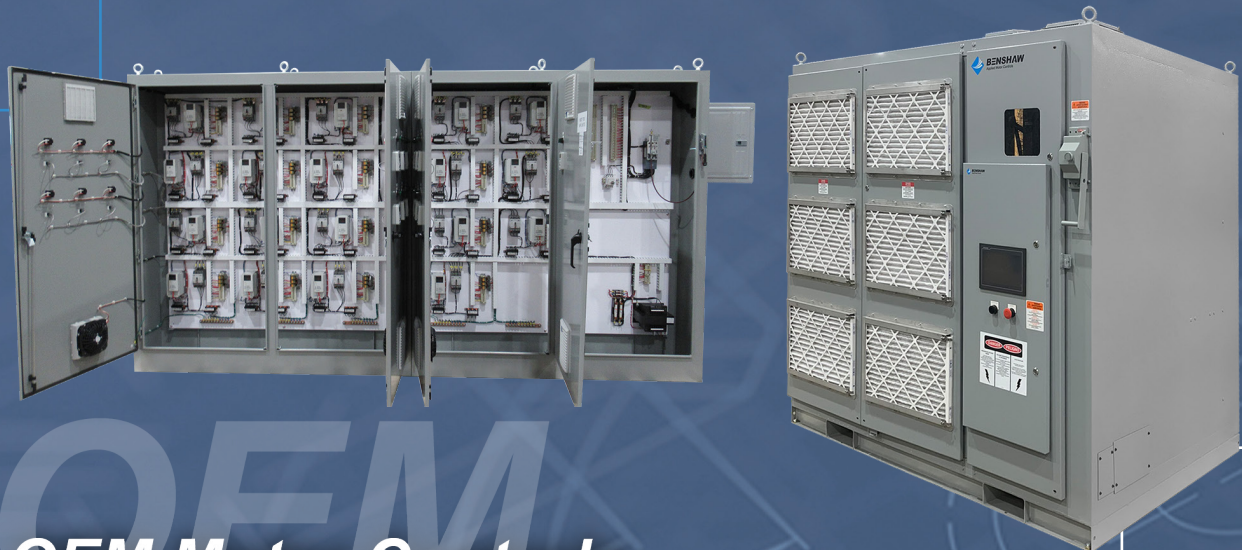




BENSHAW

Applied Motor Controls

AN **AMCONEX GROUP** COMPANY



OEM Motor Controls

Custom OEM Motor Controls

Benshaw MOEM Controls Division - Pittsburgh, PA

Benshaw

A world Leader in Custom Solutions for Electric Motor Control.



High-quality, low-cost control solutions backed by unparalleled engineering, service and support.

Since its founding in 1983, Benshaw has grown to become a leader in custom motor and machine controls. Benshaw maintains its leadership position by listening carefully to partners and responding with products, services and capabilities specifically designed to address their needs:

- Regional production facilities with economy-of scale benefits and global sourcing capabilities
- Custom engineering and controls integration expertise
- Prototyping and testing to meet all major regulatory compliance standards
- ISO-certified quality and automated efficiency across all products and services
- World-class 24/7/365 after-market training, service and support

Single-source responsibility

From engineering and panel prototyping to enclosure and wire harness fabrication, machining and assembly, Benshaw offers the convenience and cost advantages of single source responsibility across a full range of electro-mechanical starters, solid-state controls and drives.

Benshaw is widely recognized as an innovator in the machine control industry. We approach complex control applications with unrivaled engineering and design experience, and work closely with partners toward an optimal control solution.

Automation efficiencies

Benshaw's proprietary workflow automation system streamlines the entire production process, eliminating a number of manual functions from order entry, scheduling, engineering and materials requisition to assembly, billing and payment.

The result? Increased operational efficiency, reduced opportunities for error, shorter lead times and lower panel costs than typically experienced through a local panel shop, component manufacturer or third-party integrator.

Global sourcing

Benshaw's centralized material management staff sources all raw materials and electrical components on a global basis, working to find the best possible value for our customers.

Responsiveness

Benshaw's state-of-the-art manufacturing facilities combine the convenience of regional proximity with the cost advantages of a single, large-scale operation and an extensive global supply chain.

All of Benshaw's manufacturing operations and information systems are linked for instantaneous transfer of engineering data and work order specifications.

Standards compliance

Benshaw provides design and testing services to ensure UL, CSA or CE compliance and can acquire all of the necessary machine and motor control listings and certifications.

ISO certification

Benshaw invests heavily in state-of-the-art production and process control technologies to achieve the highest possible quality at the lowest possible cost.

All operations are ISO certified, and all components, enclosures, parts and materials are inspected, tracked and kitted per ISO 9001 protocols to ensure timely processing of orders.

After-sale service and support programs

Benshaw's dedicated, knowledgeable technicians are available to answer questions and provide support before, during and after the sale.

Repairs, spares, field engineering, retrofits and training - whenever and wherever needed - are all part of our commitment.

Single-Source Responsibility

Benshaw's structured motor/machine control development process.

UNIQUE
APPLICATION
PARAMETERS

VALUE
ENGINEERING
PROCESS

MACHINE AND
MOTOR CONTROL
DOCUMENTATION

PROTOTYPING
AND TESTING

AGENCY
CERTIFICATION
AND LISTING

REPETITIVE
MANUFACTURE
OR ASSEMBLE-
TO-ORDER

HMI design

Benshaw works closely with its partners to combine advanced motor and machine control technologies with the latest communications capabilities - delivering optimum performance and optimized human machine interface.

Control customization

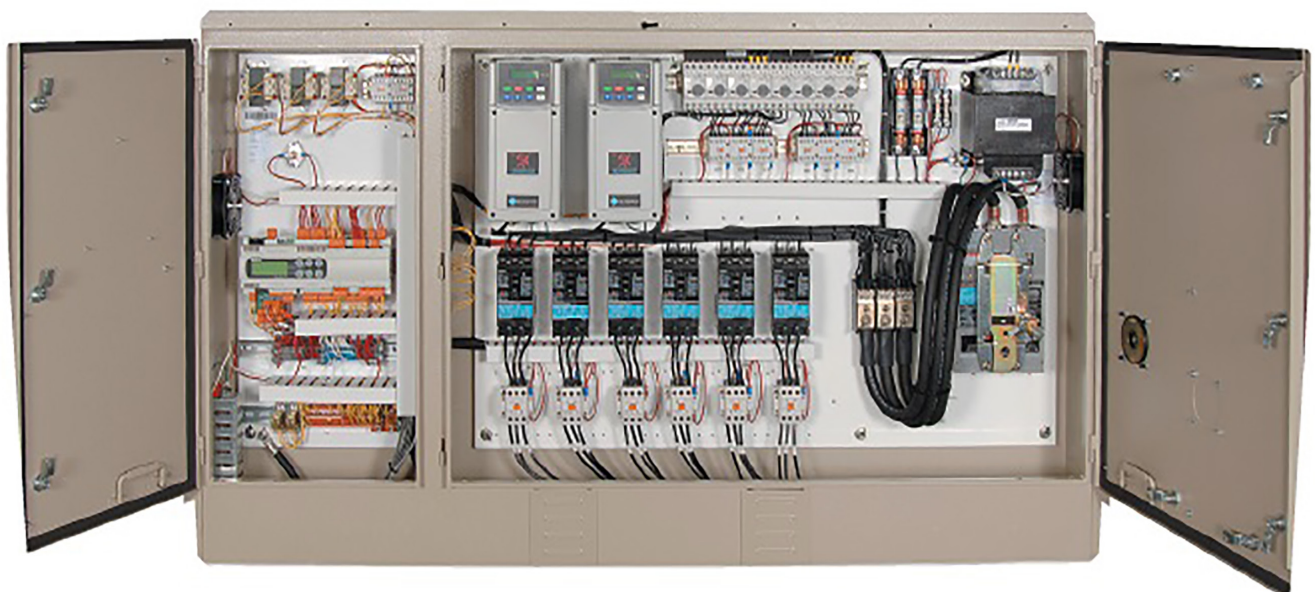
Benshaw supports all major control network protocols and offers more than 250 control hardware modifications and accessories - including pilot devices, PLCs, control power transformers and switches, meters, relays, space heaters and protective devices.

Plug-and-play wiring solutions

Investments in the very latest automated wire cutting, marking, crimping and harness fabrication systems have resulted in reduced cycle times, superior wire harness quality, spot-on consistency and plug-and-play simplicity for control panel installations.

Assemble-to-order and repetitive manufacturing capabilities

Benshaw manufactures control systems on a repetitive or assembled-to-order basis, as required. All panels are produced in accordance with a machine manufacturer's master schedule, with Benshaw meticulously managing every aspect of the control system workflow and supply chain to support the master schedule.



Integrated Control Solutions

Benshaw Motor Control Systems

Benshaw offers custom-configured motor control centers built to the UL 508A standard, tailored to fit your application needs. Our solutions include various combinations of full-voltage starters, solid-state starters, variable speed drives, and breaker feeders.

BMCS Features

- NEMA 12 standard
- NEMA 3R, 4 and 4X Stainless steel (optional)
- Flange handle standard
- Separate Control Wire way
- Horizontal ground bus
- Vertical ground bus
- Isolated Line and Load Power Wire Tunnels on left side
- Horizontal Bus up to 2000 amps

Ratings

- Up to 65kA
- UL/cUL 508A

Configurable with:

- FVNR - ATLs Full Voltage Starters
- Soft Starters
- Variable Frequency Drives
- Circuit Breaker Feeders
- Power distributor Panels
- Incoming / Motor Lug Only
- Main Breaker



Available in two heights:

- 79" High
- 90" High

79" Single Section

Size	600V Soft Starter	600V VFD	600V ATL
24" Wide	200HP	75HP	600HP
30" Wide	400HP	100HP	600HP
40" Wide	600HP	150HP	600HP

79" Two-High Section

Size	Soft Starter	VFD	ATL
24" Wide	100HP @ 600V	15HP @ 600V	200HP @ 600V
30" Wide	60HP @ 600V	10HP @ 480V	Up to 100HP @ 600V

Integrated Control Solutions

System solutions are a central focus of our business, and a competitive value for our customers.

Benshaw's success in the marketplace is a direct result of our willingness as a company to think "beyond the box." We've made systems solutions a central focus of our business, and we make learning your business a top priority.

By focusing on the bigger picture, we gain a better understanding of your process, your control requirements and your market objectives.

We then apply that knowledge toward the development and production of complete, cost-effective, fully integrated control solutions.

Customized enclosures

Benshaw takes great pride in our ability to design and deliver custom control enclosures that truly complement the form and function of your machine.

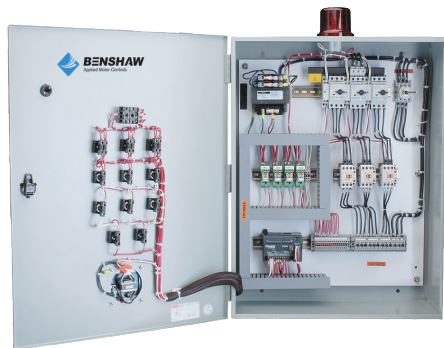
NEMA 1, 3R, 4 and 12 enclosures in unit-mount, console-mount, free-standing and wall-mount configurations are available to suit your needs.

Every enclosure we design is carefully crafted to meet your dimensional requirements, prototyped and tested for fit and compliance with relevant safety standards, fabricated to exacting tolerances and finished to your paint specifications.

Intelligent motor controls

Benshaw offers a full range of intelligent, programmable, and low-and medium-voltage starters and drives-from fractional to 30,000HP - to meet a variety of motor control needs.

Motor control products include full-voltage starters, solid-state reduced-voltage starters and variable frequency drives. Reversing, two-speed, DC braking, wye-delta, synchronous and wound rotor control are supported.



Integrated Control Solutions

Integrate machine logic

Benshaw can supply standard or PC-based programmable logic controllers, and will custom design hardware or software to meet process requirements.

Networking capabilities, remote monitoring and custom-designed human machine interface packages are also available.

Integrate control sensors

Benshaw can integrate any number of sensors, transducers, relays, switches, meters and protective devices, as required, to precisely monitor and respond to all critical process, machine or environmental variables.

Integrate power packages

Benshaw can also incorporate all of the power distribution components needed for your machine in one simple, plug-and-play package.

Turnkey power distribution packages typically include all internal and external motor control wiring harnesses, power wiring harnesses, motor/machine sensor connections and, if needed, a fully integrated power factor correction unit.

All power systems are factory tested at Benshaw with custom-built machine simulators and wire-pull testers to guarantee reliable performance.



Medium Voltage 4160V and 2300V, 60Hz, and 3300V, 50Hz

*predator*TM

Custom Panel Configurator

Benshaw's success in the OEM market is a direct result of our willingness as a company to think "beyond the box." We've made systems integration a central focus of our business, and we make learning your business our top priority.

By focusing on the bigger picture, we gain a better understanding of your process, your control requirements and your market objectives. We then apply that knowledge towards the development and production of complete, cost effective, fully integrated control solutions.

Benshaw Inc. has been utilizing the *PREDATOR* process for nearly 20 years in the OEM Division.

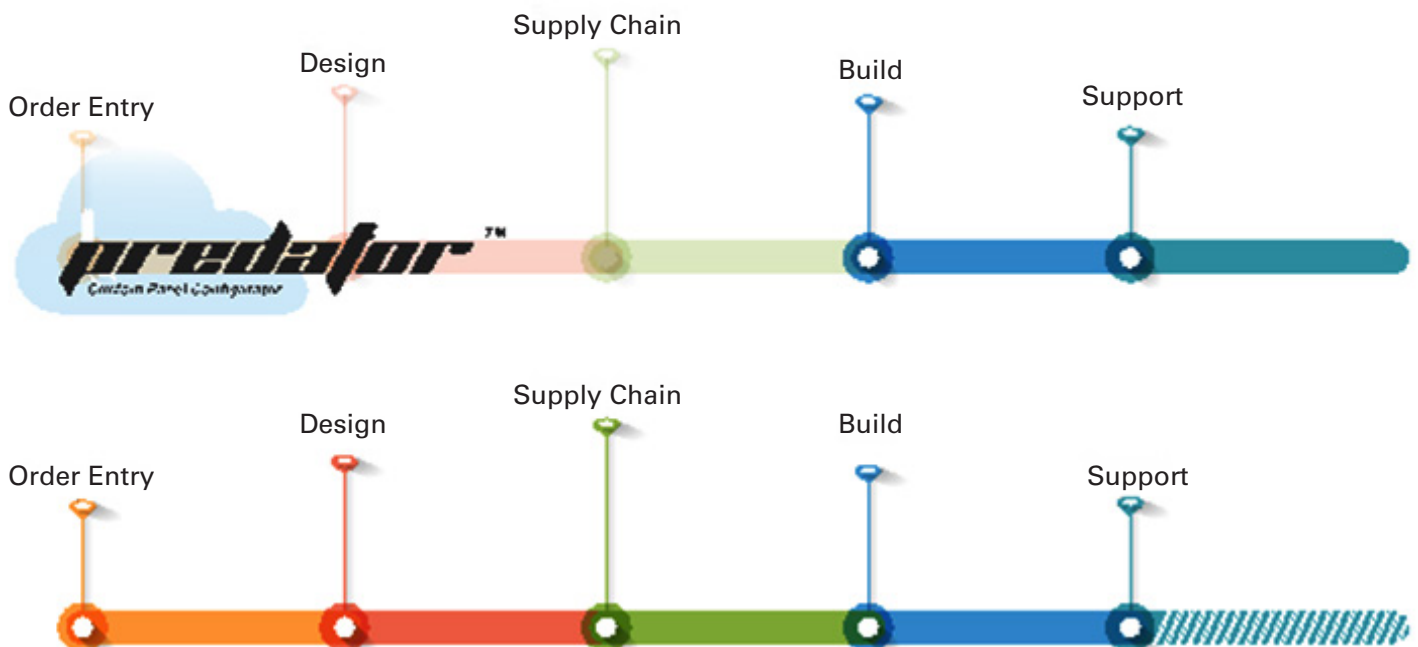
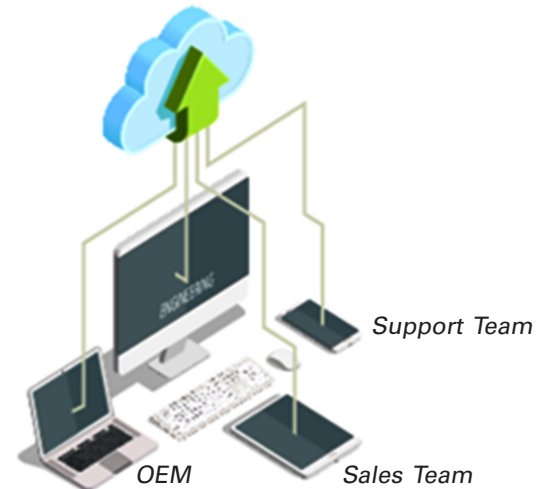
Once your Low Voltage Starter Program has been fully implemented, the order entry, design, and supply chain cycles are eliminated from the workflow process significantly reducing lead times when compared to our competitors.

Where the original Predator process ended after the Build Cycle, the Predator 2.0 Advanced Workflow Automation Process has been expanded beyond to include:

- Interactive Spare Parts Finder
- Automated Spare Parts Ordering Process

Predator ERP Automates:

- Order Entry
- Engineering
- Supply Chain



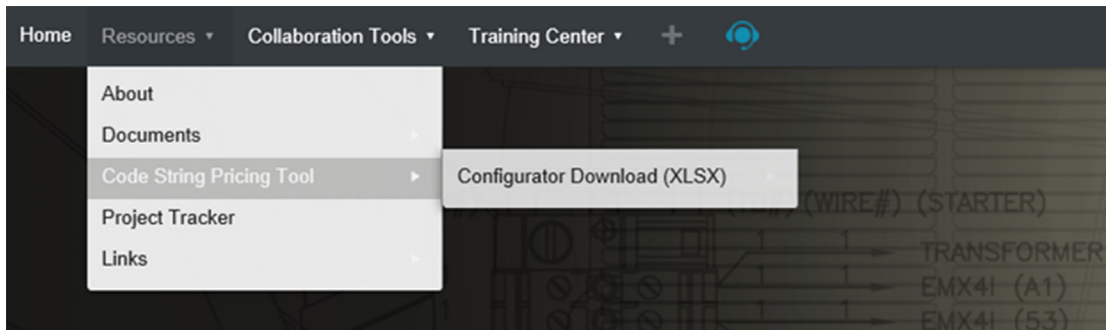
OEM Partner Portal

Benshaw Partner Portal account.

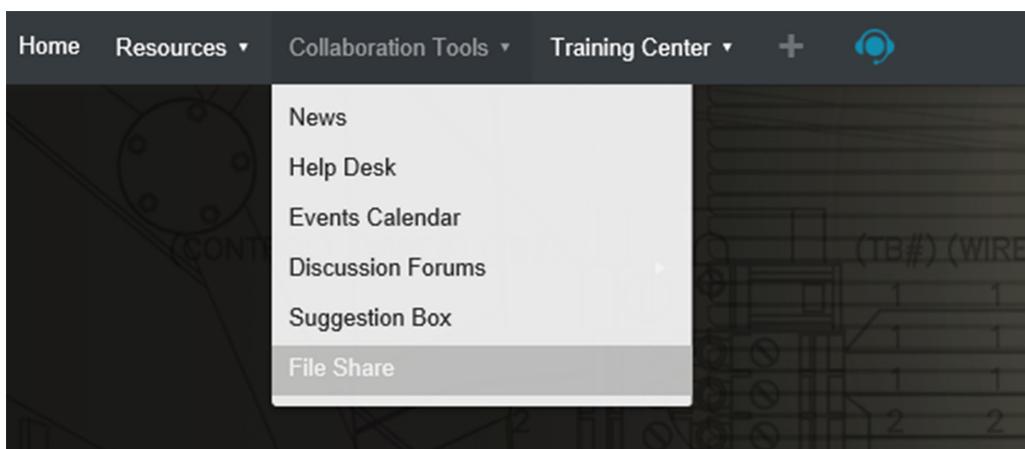
Once fully configured, your Benshaw Partner Portal will allow you to begin the PREDATOR 2.0 process.



- Predator Custom Panel Configurator
- Documentation Library
- Project Management Tools

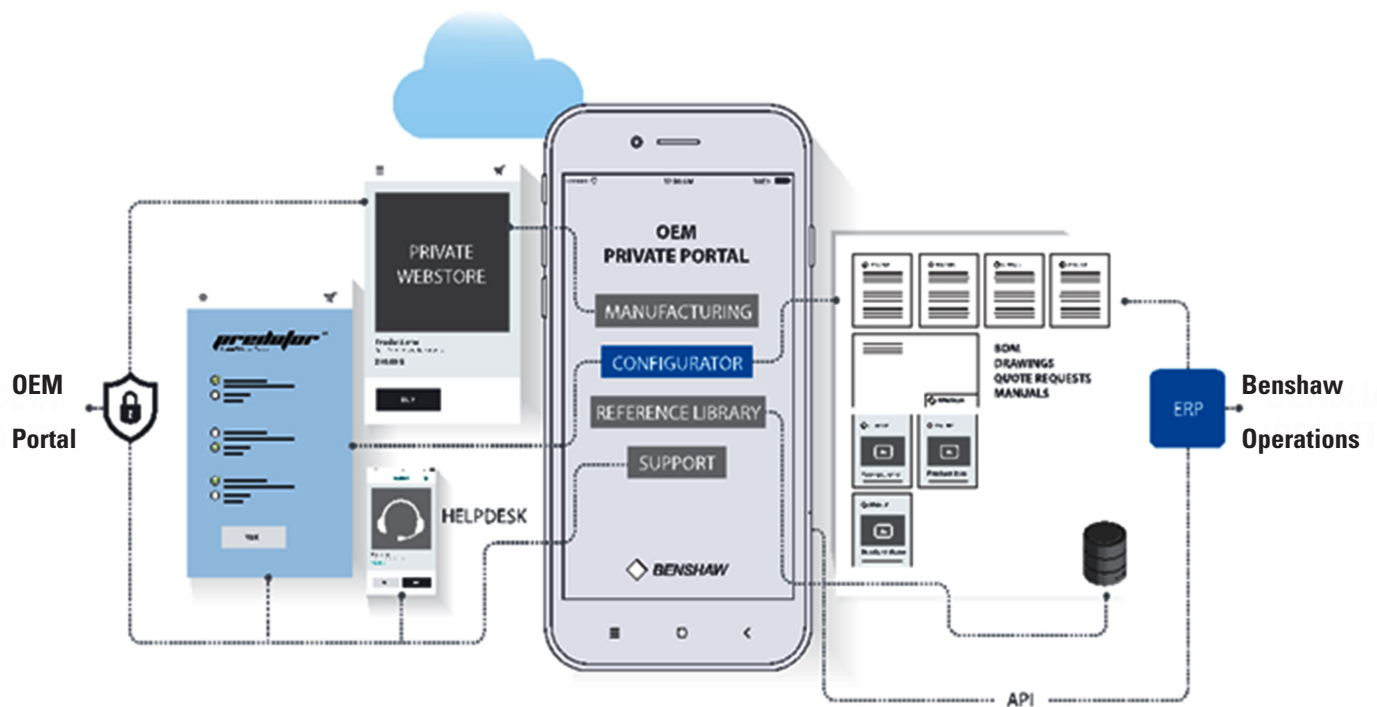
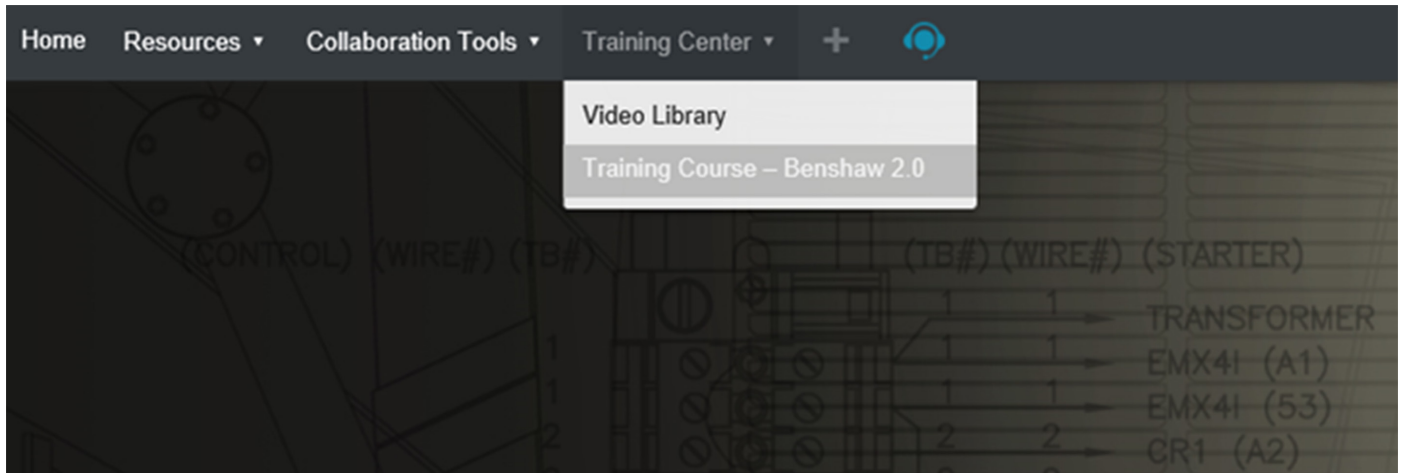


- Collaboration Tools
- Help Desk/Ticketing System
- Dropbox



OEM Partner Portal

- Online Training Center
- Private Webstore (Optional)



Global Supply



Global sourcing ensures the availability of a stable supply of high-quality, low-cost raw materials and components at all times.

One of Benshaw's greatest strengths is the ability to source raw materials and off-the-shelf electrical components - in quantity - from supply chain partners in North America, China, Taiwan, India, Korea and Europe.

Selective sourcing

Benshaw's materials management staff continuously monitors key supply markets to identify new sourcing opportunities. Due diligence is performed on a regular basis with current and prospective vendors to verify quality claims and identify value opportunities.



Economies of scale

Benshaw works closely with selected supply chain partners to forecast volumes, negotiate prices and establish buffer stock requirements, thereby ensuring relative price stability and a stable flow of material to meet production demands.

By coordinating purchases for all manufacturing operations through its centralized materials management system, Benshaw achieves substantial economies of scale.



Benshaw's global supply chain and coordinated purchasing achieves substantial economies of scale.

Manufacturing Facilities

Delivering manufacturing excellence through state-of-the-art technology in both regional and global facilities - combining the agility of local operations with the scale, efficiency, and economy of world-class global organization.

Benshaw, manufacturing excellence is driven by advanced, state-of-the-art equipment and unique distributed production model designed for speed, flexibility, and reliability.

Our facilities feature cutting-edge machinery, including a four-station CNC machining center capable of handling large-scale, complex designs with precision. We also operate a seven-station wire harness machine equipped with Ferrell connector capability and integrated wire marker printing, ensuring accuracy and consistency in every build.

To maximize efficiency, Benshaw uses a high-speed panel layout machine capable of drilling and tapping multiple panels simultaneously - enabling us to execute multiple projects in parallel and accelerate delivery timelines.

All manufacturing operations are seamlessly integrated with centralized engineering and order management systems, enabling real-time coordination across the entire organization.

Industrial Customer Benefits:

Faster turnaround times

Seamless project management from design to delivery

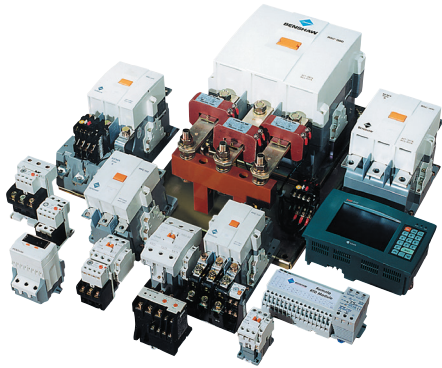


Distributed Manufacturing for Unmatched Reliability



International Standards Compliance

Benshaw offers a full range of rugged, reliable, internationally compliant motor and machine control solutions.



Full-voltage controls and wye-delta starters

Benshaw offers a full line of contactors, overload relays, full-voltage and wye-delta starters. All units are UL® listed, IEC or NEMA rated.

Benshaw contactors have the highest mechanical ratings in the industry and are designed with user-friendly features such as universal coils and extra auxiliary contacts. Modular accessories include mechanical interlocks, terminal covers, mechanical latches, auxiliary contacts and AC/DC coils.

Variable frequency drives

Benshaw offers a complete family of variable frequency drives from 1HP to 700HP. Drives are rugged and easy to use, featuring intuitive, menu-driven programming and robust power sections to meet any application.

Low-voltage solid-state starters

Benshaw is widely recognized as a world leader in solid-state starter technology. Benshaw's solid-state starters combine a rugged, reliable power section with the most advanced motor control functionality in the industry.



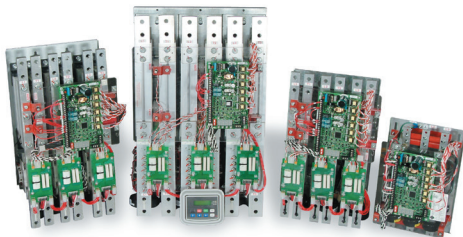
Medium-voltage controls

Benshaw designed and manufactured the first production medium-voltage solid-state starter in 1988 and today has over 3,000 units installed worldwide.

As a global leader in 2,300V to 15kV solid-state control, Benshaw has pioneered every major innovation in medium-voltage power electronics.

Benshaw's medium-voltage starters are fully programmable, UL® listed through 5kV Class and NEMA Class E2 compliant. These integrated control units include power and control electronics, bypass and isolation contactors, fiber optic firing and a fusible load break switch to reduce maintenance and operating costs compared to other starting methods.

Benshaw's medium-voltage drives are fully programmable, modular-multilevel, scalable with a multiple-use technology platform, and up to 10,000HP with 7.2KV Class systems.



Real-Time Quality Assurance

Benshaw's commitment to real-time quality assurance and operational excellence delivers the shortest lead time in the motor control industry.

Accuracy, repeatability and on-time performance are critical factors for customers and top priorities at Benshaw.

Benshaw's commitment to panel quality is evident in every one of the company's state-of-the-art production facilities. It's evident in Benshaw's implementation of an advanced, industry-leading workflow automation system, and it's evident in the company's ISO 9001 certification for quality assurance systems, production controls and business processes.

Benshaw's abilities for rapid innovation, operational efficiency and high-volume, high-quality production - on demand - are demonstrated on a daily basis.

Intelligent engineering

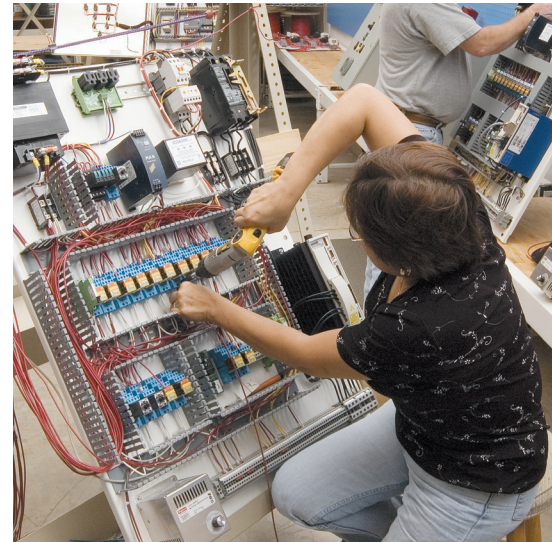
Benshaw's abilities for rapid innovation and assembly are grounded in the company's extensive engineering expertise and its focus on designing for "manufacturability."

With the right panel design, reliability and cost-effectiveness are assured, and quality becomes a matter of execution.

Integrated information system

To facilitate that execution, Benshaw has built an extensive, fully integrated, highly automated information system.

Engineering drawings, materials requisitions, work orders, change orders, master schedule commitments, contact information, delivery details - every piece of information required to fill and order accurately and on time - is available to any employee, in any plant, at any time.



ISO 9001 certified with industry-leading accuracy and repeatability.

Real-time quality assurance

Benshaw's NEMA 1, 12, 3R, and 4 UL listed enclosures are fabricated and configured using the latest mechanical and plasma cutting technologies. Heatsinks, busbars and other metal parts are machined on numerically and computer-controlled equipment to help ensure accuracy, repeatability and compliance with customer requirements.

Power stack modules are machined, finished, assembled and validated in-house to specified tolerance. Power devices are assembled and verified to the appropriate heatsink prior to electrical assembly and testing.

Benshaw's assembly teams perform a preliminary quality assurance inspection before delivery is made to functional test cells. Starter and drive assemblies undergo a variety of testing, procedures, including motor operation testing, control circuit testing, wire-pull testing, electrical performance checks, mechanical alignment inspection, torque measurement and user interface/pilot device functionality.

All test processes meet or exceed ISO 9001 requirements, and all test results are documented and archived for quality verification.

Employee training

To maintain quality standards and drive home the need for operational efficiency, Benshaw invests a great deal of time and effort in training its employees on all the systems and procedures put in place to support them.

After-Sale Service and Support Programs



On-Site Commissioning Process

Our on-site commissioning process is designed to help you start up go as smoothly as possible.

Benshaw Field Engineers work directly with your internal staff to direct and/or support the commissioning of your project. Our commissioning team has extensive experience in soft starter implementations across a broad range of industries and applications.

Field Service Process

During the field service process, Benshaw engineers inspect wiring and help set up your new motor starting equipment. Key steps in the process include:

- Checking motor starter inputs and outputs
- Performing low voltage simulations (where appropriate)
- Providing a written commissioning report

Documentation/Training

Benshaw provides comprehensive documentation for all complete motor control projects. We also provide extensive training opportunities to share our knowledge with your team and any associated contractors tailored to your needs.

Technical Support/Troubleshooting

Benshaw's Technical Support Center is staffed 24/7/365 to assist with any technical questions you may have. Support inquiries, whether requested through our Technical Support Hotline, by email or through our online ticketing system, are routed to qualified engineers with extensive experience. Our support team has access to a myriad of diagnostic tools to help them understand the conditions of any indicated fault. Field Service can also be arranged, as needed, to help troubleshoot and repair complex issues or faults that cannot be resolved remotely.

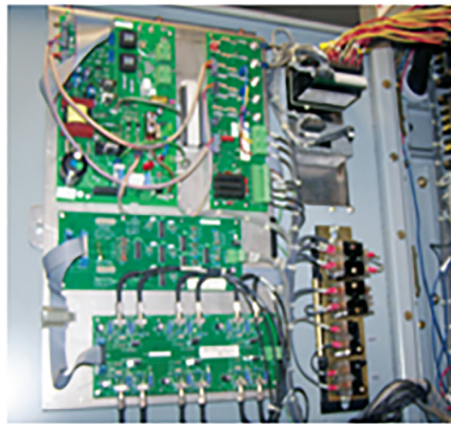
After-Sale Service and Support Programs

Service Contracts/Retrofits

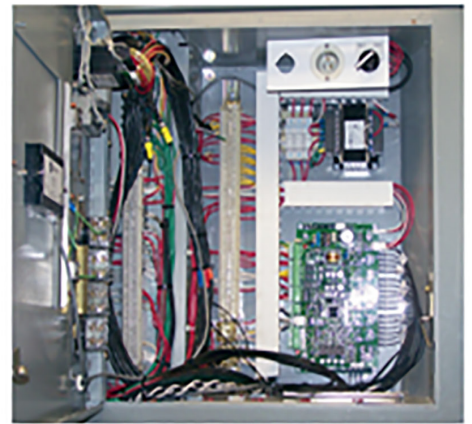
Space constraints, new wiring requirements and other expenditures can easily turn an equipment replacement project into a CAPEX nightmare. Our retrofit solutions, on the other hand, provide an opportunity to lower total project costs by upgrading only the components that need enhanced performance. Benshaw offers a range of retrofit options for upgrading almost any type of starter or variable frequency drive: From Emergency Quick-Ship Retrofit kits to complete motor control modernization packages.



Low Voltage Retrofit Kit



Before: obsolete controls



After: new controls

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For more information and your local contact visit www.benshaw.com

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