RSi Variable Frequency Drive Products and Systems

with powerful, intuitive user interface

Complete family of ac drives
Application / engineering support
Multi-purpose micro drives
NEMA 4X washdown drives
High performance industrial drives
QuickShip program
IEEE 519 clean power drives
Integrated communications/systems
24/7 service and support

CURTISS WRIGHT
Flow Control Company
BENSHAW
Variable speed drive solutions

From a world leader in MISSION CRITICAL motor control

Benshaw offers a complete family of variable speed drive solutions:

- Multi-purpose micro drives
- High performance industrial drives
- IEEE 519 clean power drives
- NEMA 4X washdown drives
- Packaged drives
- Turnkey drive control systems

As a pioneer in the motor control industry, Benshaw has led the effort to expand the market for variable speed drives to include many applications that were once considered unobtainable.

Through extensive research, in-depth testing and real world applications experience, Benshaw offers a complete range of variable speed drive solutions … from multi-purpose micro drives and high performance industrial drives to IEEE 519 clean power drives, NEMA 4X washdown duty drives and custom configured packaged drive solutions … with services and support capabilities available to meet the motor control needs of a broad range of industries and applications.

Reliable drive products

A principle factor in Benshaw’s rapid expansion in the variable speed marketplace is our focus on quality and the attention we’ve paid to the issues that are key to our customers … reliability and ease-of-use.

Benshaw’s intuitive operator interface, rugged construction standards, ISO certified quality control systems and an integrated approach to engineering have resulted in a new generation of variable speed drive products that are easier to set up, easier to operate, easier to network and more reliable than ever.

In fact, when the application is demanding and the environment harsh, more customers now turn to Benshaw than any other motor control brand.

Rugged. Reliable. Ready.
High performance, sensorless vector drives

Benshaw’s variable speed drive products have earned a solid reputation for rugged, reliable performance in a variety of demanding applications—from pumps, compressors and chillers to fans, blowers, crushers, and conveyors.

All of Benshaw’s drive products include an intuitive user interface, integrated control and power electronics, and can be provided with bypass and isolation contactors, and a myriad of user-friendly, user-selectable options.

On-board metering, plain English data displays, Fieldbus communications capabilities and integrated motor/load protection.

Engineered drive packages

Benshaw’s engineering and design teams draw on extensive real-world drive applications experience. If a standard drive doesn’t fit your needs, Benshaw can engineer and build one that does—with the shortest lead time in the industry.

Custom-engineered drive systems

Benshaw can also design and manufacture a complete custom-engineered drive system or motor control center to meet your industry- or application-specific requirements.

World-class pre and post-sale service and support

Benshaw’s dedicated, knowledgeable technical support staff is available to answer your questions before, during and after the sale. To help you select the best drive solution available, Benshaw can offer a wide range of engineering and applications support services, including harmonics analysis, application analysis, design consultations, retrofit services.

Drive repairs, spare parts, field engineering, retrofits and training—whenever and wherever needed—are all part of our commitment.
World-class drive products

Benshaw offers a variable frequency drive for any industry and any application.

Benshaw offers a wide range of standard drives and engineered drive packages … from 1 to 700 horsepower. All are rugged, reliable and easy to use, with intuitive, menu driven programming features and robust high quality power sections to support your toughest variable speed applications.

Whether your motor control application is simple or highly complex, Benshaw’s flexible I/O functionality and user-selectable control strategies allow the user to optimize the drive to individual application and operating conditions.

**GX Series micro drives**
Full featured GX Series micro drives combine exceptional performance and ease of use in a compact, economical unit.

**SG Series high performance sensorless vector drives**
SG Series drives are designed for hard to start applications that require high starting torque. Benshaw’s sophisticated auto-tuning algorithm senses internal motor parameters to optimize drive performance and provide precise speed regulation.

**SG519 Series clean power 18 pulse drives**
Benshaw’s clean power drive family meets IEEE519-1992 standards for harmonics. SG519 drives include an 18 pulse transformer and additional diode bridge rectifier to reduce harmonic distortion below 5%.

**S4 Series washdown duty drives**
Benshaw’s S4 drive family is designed to perform in wet, dirty or corrosive environments. The S4’s standard NEMA4X polycarbonate enclosure can be mounted in washdown environments and in the harshest operating conditions.

**SGP built-to-order drives**
Benshaw is the world leader in quick shipment of built-to-order engineered drive packages. SGP packages feature SG Series drives with your choice of disconnect, bypass, line and load reactor and control options.
standard drives
engineered drives
integrated systems

Engineered solutions
Benshaw also provides complete custom engineered drive packages to your specification, with enclosures, bypass configurations and disconnects tailored to meet your application requirements.

In fact, 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 customers to find an optimal drive solution.

Benshaw’s intuitive drive interface and expanded communications options simplify remote monitoring and connection of Benshaw controls to your network.

All drives include one integrated RS-485 port with Modbus RTU as the standard protocol. Additional communications protocols are supported through optional communications boards for simple, plug-and-play networking:

- Modbus TCP (Ethernet)
- Profibus
- Devicenet
- Lon Works
- BacNet

Intuitive. Intelligent. Easy.

All Benshaw variable speed drives share a common, intuitive interface for quick setup, simplified programming and ease of operation. The powerful Windows-based DriveView software provides complete monitoring, trending and commissioning support.
World-class service and support

Benshaw provides world-class, comprehensive service and support—before, during and after the sale—to help you achieve your most demanding motor control objectives.

As the world leader in mission critical motor control and protection, Benshaw’s drive engineering expertise and real world applications experience provides precise solutions to your motor control applications.

Applications support

Benshaw’s team of well-trained motor control experts is available to review your application and operational requirements. Specific recommendations are provided to help you select the right drive solution for your needs:

- Application analysis
- Environmental considerations
- Motor control parameters
- Drive quotation

Drives engineering

If a standard drive package doesn’t fit your requirements, Benshaw’s product engineers will engineer one that does.
Technical training
Benshaw’s customer care centers provide both classroom and hands-on training for basic drive principles, electrical/electronic maintenance and diagnostics, customized maintenance programs and operations based systems.

Repairs
Drive repairs are made by trained, experienced personnel, using the latest diagnostic and testing equipment to service printed circuit boards, power electronic control assemblies and electrical subassemblies.

Field engineering
Benshaw can also dispatch experienced field engineering experts on short notice to help with drive commissioning, harmonics analysis, data collection, trending issues, field repairs, onsite training or preventive maintenance.

Support
Benshaw offers 24/7 technical phone support to help you solve your drive problems as quickly as possible.

Regional warehousing for standard products, spares and components
Standard drives, critical drive parts, packaged assemblies and components are stocked and ready to ship.

The Benshaw Promise
Every Benshaw variable speed drive is guaranteed for two full years. Other manufacturers limit their warranties to just one year. But at Benshaw, we believe that since we build them better, we can guarantee them longer. That’s “the Benshaw Promise.”
GX Series multipurpose micro drives

COMPACT, rugged sensorless vector drives

Constant Torque:
- 1 to 5 HP @ 230 Vac
- 1 to 5 HP @ 460 Vac

GX Series micro drives from Benshaw provide a rugged, compact, economical chassis drive solution for low horsepower applications.

Each drive in the GX Series offers quick setup and preconfigured settings for common variable frequency drive applications, and a flexible, programmable I/O for more demanding applications or complex control strategies.

Key features:
- Compact design
- Integral PID control
- Sensorless vector control or V/Hz control
- Adjustable carrier frequency
- Programmable I/O
- Standard dynamic brake transistor. External resistor required.

Compact design
GX Series variable frequency drives pack substantial power and flexibility into an economical, space saving package.

Intuitive interface
GX Series drives provide a user interface with a four digit LED display and four directional keys for simple, menu-based setup and operation.

Heavy duty power rating
The GX drive family features a rugged power section that can provide up to 150% current for 60 seconds.
Integrated PID control
The GX Series drive includes standard PID control to regulate pressure, temperature or flow in fan and pump applications.

Control method
GX Series drives feature user selectable open loop V/Hz control and sensorless vector control.

Flexible programming
Over 200 programmable parameters are available across four configuration groups.

Global compliance
Benshaw’s GX drive family meets CE and UL (Type 1) compliance standards.

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**NEMA 1 CONDUIT KITS**
- GX-NEMA1KIT-A: Conduit Kit For 1 HP GX Drive
- GX-NEMA1KIT-B: Conduit Kit For 2 HP GX Drive
- GX-NEMA1KIT-C: Conduit Kit For 3 HP AND 5 HP GX Drive

**REMOTE KEYPAD**
- VFD-2M-GX-KEYPAD: Remote Mount Keypad and 2 Meter Cable

- Units are stocked as protected chassis. If NEMA 1 enclosed is required, add NEMA 1 conduit kit. Conduit kits will need to be installed by customer.
- Web stocked | 150% / 1 min.
**S4 Series NEMA 4X washdown drives**

**Standard Duty:**
- 1 HP @ 115 V
- 1 to 25 HP @ 230 Vac
- 1 to 200 HP @ 460 Vac
- 1 to 200 HP @ 600 Vac

**NEMA 4X WASHDOWN drives for severe environments**

Benshaw S4 Series sensorless vector drives, 100 HP and below, are designed for high pressure washdown applications and are built to withstand the harshest industrial environments.

S4 Series drives feature a rugged polycarbonate enclosure that exceeds NEMA 1, 12, 4 and 4X standards, with double labyrinth seals that keep dust, dirt, oil and water from entering the drive at pressures up to 1,000 psi.

230 V and 460 V S4 Series drive models are web stocked for immediate shipment. 600 V models are also available.

**Standard features:**
- NEMA 4X / IP 66 washdown duty enclosure (100 HP and below)
- Gasketed, double labyrinth seal withstands high pressure washdown to 1,000 psi
- Standard and heavy duty ratings
- Standard braking transistor and resistor
- Sensorless vector control
- High starting torque
- Arctic Mode - maintains safe operation in cold environments
- LCD plain English display
- Integrated PID control
- Standard sequencer software
- Standard Modbus communications port

**Standard Duty power rating**
The Standard Duty rating provides overload protection at 120% current for 60 seconds.

**Heavy Duty power rating**
The Heavy Duty rating provides a more robust power section for loads requiring higher starting torque and higher peak overloads of 150% for 60 seconds.

**Integrated software**
Regenerative software is included to eliminate regen energy on overhauling loads. Sequencer software is also included as standard.

**PID control**
S4 drives feature an integrated PID control algorithm to regulate pressure, temperature or flow. PID process variables can be set in “real” values, eliminating the need for confusing conversions.

**Dynamic braking transistor and resistor**
S4 drives include as standard a dynamic braking transistor and resistor to decrease deceleration times and eliminate regenerative energy. An optional external resistor can be added for even faster stopping times.
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Web Stocked | * Units ending in “D” are NEMA 12 and not washdown.
Benshaw’s rugged, flexible SG Series drives are designed to handle the most demanding variable speed drive applications.

SG Series sensorless vector drives are easy to install and configure. Standard drives are web stocked for immediate shipment. Custom SG Series drive packages are also available on a built-to-order basis, with enclosures, disconnects, bypasses, pilot devices, and magnetics options available to meet more precise motor control requirements.

All SG Series units feature a flexible power stack with three power ratings.

**Variable Torque:**
- 7.5 to 40 HP @ 230 Vac
- 7.5 to 700 HP @ 460 Vac
- 7.5 to 400 HP @ 600 Vac

**Standard Duty:**
- 7.5 to 40 HP @ 230 Vac
- 7.5 to 600 HP @ 460 Vac
- 7.5 to 400 HP @ 600 Vac

**Heavy Duty:**
- 5 to 30 HP @ 230 Vac
- 5 to 500 HP @ 460 Vac
- 5 to 300 HP @ 600 Vac

**Key features:**
- Rugged, reliable design
- Programmable I/O
- Integral PID control
- V/Hz or sensorless vector control
- Variable torque, standard and heavy duty ratings
- Start methods: accel, DC start, flying start
- Stop methods: coast, decel, DC inject, flux
- Uploadable, downloadable keypad
- Built-in protection features
- Standard Modbus communications
- Windows-based software
- Integral multiple motor control from one drive for pumping applications

**Standard Duty, Variable Torque Rating**
The standard duty, variable torque rating allows overloads of 110% for 60 seconds. For most fan and pump applications, energy savings can be optimized by setting the V/Hz pattern to squared.

**Standard Duty Rating, Constant Torque Rating**
The standard duty, constant torque rating allows overloads of 120% for 60 seconds. Torque can be maintained by setting the V/Hz pattern to linear.

**Heavy Duty, Constant Torque Rating**
Heavy duty ratings provide a more robust power section for loads requiring higher starting torque and higher peak overloads of 150% for 60 seconds.
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VARIABLE TORQUE = 110% current for 1 minute  |
STANDARD DUTY = 120% Current for 1 Minute  |
HEAVY DUTY = 150% Current for 1 Minute

Units ending in a “B” designate NEMA 1. Units not ending in a “B” are protected chassis units.

- Protected chassis only (no cover on control or power terminals)  |
- * DC Link Reactor  |
- Web stocked
SGP Series build-to-order drive packages

QUICKSHIPPED to your specification

Variable Torque:
7.5 to 40 HP @ 230 Vac
7.5 to 125 HP @ 460 Vac

Standard Duty:
7.5 to 40 HP @ 230 Vac
7.5 to 125 HP @ 460 Vac

Heavy Duty:
5 to 30 HP @ 230 Vac
5 to 100 HP @ 460 Vac

SGP Series QuickShip drive packages combine Benshaw’s rugged SG Series sensorless vector drive unit with a NEMA 12 ventilated enclosure and any of the following options:
- Disconnect
  - Circuit breaker
  - Fused switch
  - Non-fused switch
- Inline fuses*
- Line reactor*
- Output reactor**
- 3 contactor bypass
- Door mounted operator station
  (six configurations are available)

SGP QuickShip built-to-order drive packages meet UL and CE approvals and are available with standard (7.5 to 125 HP) and heavy duty (5 to 100 HP) ratings to meet your specialized drive requirements.

*Fusing and line reactor are recommended for drive protection.
**Maximum lead length of 100 ft.

Standard features:
- NEMA 12 ventilated enclosure with fans and filters
- SG Series sensorless vector drive unit
- User terminal strip
- Door mounted keypad
- Control power transformer
- User input and output power connections
Here’s how to order:

1. Choose horsepower from the list of available ratings on the right (see the Benshaw catalog for more detail).
2. Determine voltage and duty rating required for your application.
3. Select a disconnect option, door mounted devices, bypass type and reactor options.
4. Contact your Benshaw representative to place your SGP QuickShip drive order.

QuickShip Modular Options:

**Horsepower**
- 5 HP, 7.5 HP, 10 HP, 15 HP, 20 HP, 25 HP, 30 HP, 40 HP, 50 HP, 60 HP, 75 HP, 125HP

**Voltage**
- 230 V
- 460 V

**Duty Type**
- Standard duty
- Heavy duty

**Disconnect Options**
- Non-combination
- Circuit breaker
- Fusible disconnect
- Non-fused disconnect
- Inline fuse

**Door Mounted Devices**
- None
- Start/stop pushbuttons, reset pushbutton, HOA switch, speed pot
- Start/stop pushbuttons, reset pushbutton, HOA switch, speed pot, power on, VFD running, VFD fault light
- Start/stop pushbuttons, fault reset pushbutton, HOA switch, speed pot, jog pushbutton, forward/reverse switch, VFD fault light
- VFD/off/bypass switch, bypass running light
- Start/stop pushbuttons, reset pushbutton, HOA switch, speed pot, VFD running light, VFD/off/bypass switch, bypass running light

**Bypass Type**
- None
- 3 contactor bypass

**Reactor Options**
- None
- Input reactor
- Output reactor
- Input and output reactor
Our municipal projects and engineering team will work with you to configure a clean power solution that meets your specifications and requirements.

**Standard features:**
- UL listed
- Limits voltage and current harmonics to IEEE-519* levels
- Addresses poor power factor
- Eliminates expensive harmonic analysis
- Avoids resonance problems associated with inefficient harmonic filters
- Prevents overloading of circuit breakers, feeders and transformers
- Run from motor/generator systems
- NEMA 1, 12V, 3R, 4 or 4x enclosures available, plus custom configurations

IEEE 519-1992 compliant drives built to your specification

**Variable Torque:**
- 50 to 700 HP @ 460 Vac
- 50 to 400 HP @ 600 Vac*

**Standard Duty:**
- 50 to 600 HP @ 460 Vac
- 50 to 400 HP @ 600 Vac*

**Heavy Duty:**
- 50 to 500 HP @ 460 Vac
- 50 to 300 HP @ 600 Vac*

Benshaw’s SG519 Series drives are designed and manufactured to limit voltage and current distortion levels to within the levels defined by IEEE-519*. This eliminates the need for expensive, time consuming harmonic analysis and avoids the resonance problems associated with inefficient harmonic filters.

**Modular design**
The modular design of Benshaw’s SG519 Series drives eliminates maintenance problems inherent in older drive designs and improves drive reliability by significantly reducing power module part counts. This design approach also allows each drive unit to be custom-tailored to your specific requirements.

**Optional bypass**
An optional bypass design configuration (ATL or RVSS) is available for SG519 drive packages when mission critical reliability is important and disruptive downtime cannot be tolerated.

*IEEE-519, 1992 Table 10-2 and Table 10-3.
* Consult factory.
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<th>Model Number</th>
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Custom-engineered drive solutions

Whether you need simple modifications made to one of Benshaw's standard drive packages, a custom engineered, application-specific drive package or a turnkey drive solution, Benshaw can help.

With engineering experience and complete motor control system production capabilities, Benshaw delivers all of the competence, convenience and value you'd expect from a leader in engineered control systems.

Whatever your motor control needs may be, Benshaw's engineering teams and application specialists can help you find a cost-effective, reliable solution.

Quality assurance testing
Benshaw's assembly teams perform a preliminary quality assurance inspection before delivery is made to functional test cells. Drive assemblies undergo a variety of testing procedures, including motor operation testing, load 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 tests are documented and archived for quality verification.

Enclosures
• Standard NEMA 1, 12 and 3R enclosure designs
• Custom enclosures
• NEMA 4, 4X, air conditioned and other special enclosures
• Motor control centers

Combination drive packages
• 15 to 2,000 A circuit breakers
• 40 to 2,000 A non-fused disconnects
• 30 to 800 A fusible disconnects
• Flange or rotary handle mechanisms
For any drive application.
In any configuration.

Control modifications
Over 250 control modifications and accessories are available from Benshaw, including:
- Pilot devices
- PLCs
- Control power transformers
- Switches
- Meters
- Relays
- Space heaters
- Protective devices

Bypass packages
- Two contactor
- Three contactor
- Reduced voltage solid state starters

Filters
- Line reactors (3% and 5%)
- Long lead filters
- Active and passive harmonic filters
- 18 pulse systems (IEEE-519)
24/7 Technical Support
Benshaw is dedicated to providing comprehensive 24-hour-a-day, 7-day-a-week phone support. Benshaw provides repair, spare parts, field engineering, retrofit, and training services, when and where you need us. You can count on our experienced team, backed by the latest diagnostics and repair tools and an extensive parts inventory to support your operations.

Call 1.800.203.2416

24/7 Hotline Support from our operations in Pittsburgh and Listowel (Canada):

- Technical phone support
- Overnight parts shipment
- 24-hour service dispatch
- Coordination of all service capabilities

Repairs
Repairs are made on Benshaw equipment by trained, experienced personnel, using the latest diagnostic and test equipment.

Field Services are performed on-site by skilled technicians, engineers, or complete teams if needed, including:

- Start-up commissioning
- Field repairs
- Field analysis/data collection
- Preventative maintenance

The Benshaw Product Line
A wide range of motor controls and drives are available.

- Solid state starters fractional up to 30,000 HP at 15 kV
- AC drives to 700 HP
- Electromechanical controls to 800 A

Benshaw Express is a 24/7 online inventory and order entry system for authorized Benshaw distributors:

- 24/7 shipment
- Either air or truck delivery

Specifications are subject to change without notice.
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