

# Intelligent Low Voltage Solid State Motor Control Products

*with next generation **MX<sup>2</sup>/MX<sup>3</sup>** technology*



Mission critical reliability  
Patented soft start technology  
Integral digital protection and metering  
Continuous and integral bypass chassis  
RXE dual redundant configurations  
MXP modular, prepackaged starters  
Reversing, two-speed, wound rotor  
Synchronous, DC injection braking  
24/7 service and support



# New MX<sup>2</sup> Control Technology

NE~~X~~T GENERATION INTELLIGENT MOTOR CONTROL



OPTIONAL COMMUNICATIONS BRIDGE

- ModBus/TCP
- Ethernet/IP
- DeviceNet
- LON Works
- ProfiBus-DP



OPTIONAL KEYPAD



MX<sup>2</sup> BOARD

## MX<sup>2</sup> Control Highlights

The new MX<sup>2</sup> control technology from Benshaw provides a powerful, flexible, intelligent low voltage motor control platform. MX<sup>2</sup>-based controls offer multiple, user selectable starting modes, an increased selection of configurable digital and analog I/O's, comprehensive built-in metering capabilities, unprecedented onboard protection and an easy to use, intuitive user interface.

The new control board terminal configuration—coupled with programmable burden CT settings—makes Benshaw's MX<sup>2</sup> technology an excellent choice for a wide range of intelligent, soft start motor control applications.

With more built-in starting modes ... more built-in protection features ... additional communications capabilities ... improved noise immunity ... a more complete user I/O and CE compliance, Benshaw's new MX<sup>2</sup>-based low voltage motor controls raise the bar for intelligent, low-cost, soft start motor control.

When you factor in our unique three-year factory warranty and 24/7 comprehensive technical support, we think you'll find Benshaw's MX<sup>2</sup>-based controls to be the best value on the planet.

### Standard Features:

- ◆ High performance motor control with multiple starting modes built-in
- ◆ Slow Speed 7 and 14%
- ◆ 3 user configurable digital inputs
- ◆ 2 fixed inputs for start and bypass confirm
- ◆ 3 user configurable output relays and 1 fixed bypass confirm
- ◆ User configurable analog I/O
- ◆ Programmable burden CT settings
- ◆ Residual ground fault
- ◆ Advanced line / motor metering
- ◆ DC braking light and heavy duty
- ◆ Power stack thermistor
- ◆ Data snapshot of each fault
- ◆ Power up on start
- ◆ 1000V capable
- ◆ Energy saver
- ◆ Remote keypad ready
- ◆ CE, UL, CUL, NEMA compliance
- ◆ Built-in self-testing (BIST)
- ◆ ModBus 485 plus expanded communications capabilities with optional bridges

# MX<sup>2</sup> Control Features

## Multiple Starting Modes:

- ◆ Voltage ramp
- ◆ Current ramp
  - Adjustable initial current
  - Adjustable maximum current
  - Adjustable ramp time
- ◆ Torque ramp (True Torque)
  - Adjustable initial torque
  - Adjustable maximum torque
  - Adjustable ramp time
- ◆ Power ramp
  - Adjustable initial torque
  - Adjustable maximum torque
  - Adjustable ramp time
- ◆ Linear/tach feedback control
- ◆ Slow Speed 7 and 14%

## Motor Protection:

- ◆ Motor thermal overload (40 curves)
- ◆ Independent starting and running OL's
- ◆ Up to speed timer exceeded
- ◆ Low/High line voltage
- ◆ Low/High line frequency
- ◆ Stack over temperature
- ◆ Phase reversal
- ◆ Phase loss
- ◆ Instantaneous overcurrent
- ◆ Overcurrent
- ◆ Undercurrent
- ◆ Current imbalance
- ◆ Ground fault residual
- ◆ Shorted SCR
- ◆ Disconnect fault
- ◆ Inline contactor fault
- ◆ Control power low

## Metering:

- ◆ +/- 2% accuracy (True RMS)
- ◆ Average current
- ◆ L1 current
- ◆ L2 current
- ◆ L3 current
- ◆ Current imbalance %
- ◆ Ground fault amps/residual
- ◆ Average volts

## Metering, continued:

- ◆ L1 - L2 voltage
- ◆ L2 - L3 voltage
- ◆ L3 - L1 voltage
- ◆ Overload %
- ◆ Power factor
- ◆ Watts
- ◆ VA
- ◆ VARS
- ◆ KW hours
- ◆ MW hours
- ◆ Phase order
- ◆ Line frequency
- ◆ Analog input
- ◆ Analog output
- ◆ Run time - days
- ◆ Run time - hours
- ◆ # of starts
- ◆ Tru Torque %
- ◆ Power %
- ◆ Peak starting current
- ◆ Last starting duration

## 3 Digital Inputs Configurable to:

- ◆ Stop
- ◆ Fault
- ◆ Fault reset
- ◆ Bypass/confirmation & inline
- ◆ OL reset
- ◆ Local/remote selection
- ◆ Heater enable
- ◆ Heater disable
- ◆ Dual ramp selection
- ◆ 1 dedicated start input
- ◆ 1 dedicated bypass

## 3 Relay Outputs Configurable to:

- ◆ Starter off
- ◆ Faulted fail safe and non fail safe
- ◆ Running
- ◆ Up to speed
- ◆ Alarm condition
- ◆ Ready condition
- ◆ Locked out
- ◆ Over current trip
- ◆ Under current trip
- ◆ OL alarm
- ◆ Shunt trip fail safe and non fail safe
- ◆ Ground fault

## Relay Outputs, continued:

- ◆ Energy saver indication
- ◆ Heating indication
- ◆ Slow speed forward/reverse
- ◆ DC braking
- ◆ Cooling fan
- ◆ 1 fixed bypass

## 1 Analog 0/4-20mA / 0-10Vdc Input Configurable to:

- ◆ Trip high level
- ◆ Trip low level

## 1 Analog 0/4-20mA / 0-10Vdc Output Configurable to:

- ◆ Current (0-200%/0-800%)
- ◆ Voltage (0-150%)
- ◆ OL (0-150%)
- ◆ KW (0-10 Kw/0-100 Kw)
- ◆ MW (0-1 Mw)
- ◆ Analog input (0-100%)
- ◆ Firing (0-100%)
- ◆ Calibration

## User Interface:

- ◆ Standard board-mounted LED (4x7) interface
- ◆ Optional remote mount LCD display
  - Set/examine operating parameters
  - View status information
  - View line current, voltage and frequency in real time
  - Start and stop the solid state starter

## 1 Communication Port:

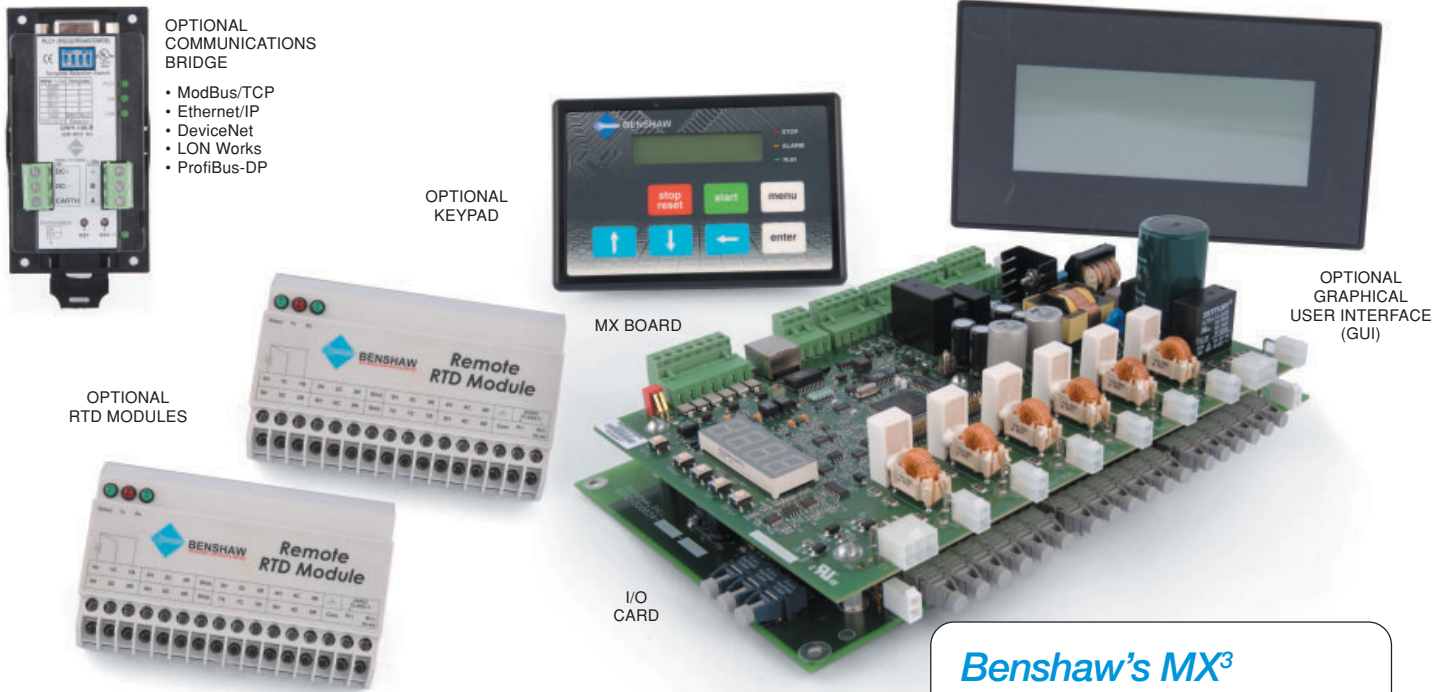
- ◆ ModBus RTU/Half Duplex
- ◆ RS485 (Isolated at 1,750 Vpk)
- ◆ Communication bridges:
  - Profibus
  - Ethernet
  - Devicenet
  - LON Works
  - Can Bus

## Advanced Functionality:

- ◆ Dual ramp selection
- ◆ Adjustable kick current
- ◆ Programmable decel modes
- ◆ LV BIST test (built-in self test)

# New MX<sup>3</sup> Control Technology

NEXT GENERATION INTELLIGENT MOTOR CONTROL



## MX<sup>3</sup> Control Highlights

Benshaw's next generation MX<sup>3</sup> technology propels low voltage motor control to even greater levels of performance and functionality. With its real-time clock, enhanced programming capabilities, ease of use, and a unique, flexible architecture—Benshaw's MX<sup>3</sup> controller delivers advanced motor control and protection with all of the rugged, dependable performance you've come to expect from the world leader in advanced controls and drives.

MX<sup>3</sup> controllers, power components, software and sensors are all designed, built and tested to perform as an integrated control system, eliminating the coordination and performance problems inherent in other forms of reduced voltage starting.

With more built-in features, more configurable options, greater expandability and a broader communications capability than any other motor control on the market, Benshaw's next generation MX<sup>3</sup> technology will shorten your commissioning times, improve motor performance and protection, enhance diagnostic capability and streamline electrical system monitoring and maintenance tasks.

### *Benshaw's MX<sup>3</sup> control technology provides all MX<sup>2</sup> features, plus:*

- ◆ 8 user configurable inputs
- ◆ 2 fixed inputs for start and bypass confirm
- ◆ 6 user configurable relay outputs
- ◆ 1 fixed output for bypass confirm
- ◆ Real-time clock
- ◆ Motor PTC input
- ◆ Zero Sequence Ground Fault
- ◆ RTD module support
- ◆ Full DC braking with add-on SCR
- ◆ Event log (99 events)
- ◆ Start per hour limiter
- ◆ Back spin timer
- ◆ Time between starts limiter
- ◆ Zero speed switch input
- ◆ Power outage ride through (PORT)
- ◆ Power factor trip
- ◆ Patented CYCLO control (0-40% speed)

# MX<sup>3</sup> Control Features

## Multiple Starting Modes:

- ◆ Voltage ramp
- ◆ Current ramp
  - Adjustable initial current
  - Adjustable maximum current
  - Adjustable ramp time
- ◆ Torque ramp (True Torque)
  - Adjustable initial torque
  - Adjustable maximum torque
  - Adjustable ramp time
- ◆ Power ramp
  - Adjustable initial torque
  - Adjustable maximum torque
  - Adjustable ramp time
- ◆ Linear/tach feedback control
- ◆ CYCLO converter control

## Motor Protection:

- ◆ Motor thermal overload (40 curves)
- ◆ Independent starting and running OL's
- ◆ Up to speed timer exceeded
- ◆ Low/High line voltage
- ◆ Low/High line frequency
- ◆ Motor OL auto lockout level
- ◆ Phase reversal
- ◆ Phase loss
- ◆ Instantaneous overcurrent
- ◆ Overcurrent
- ◆ Undercurrent
- ◆ Current imbalance
- ◆ Ground fault (residual or zero sequence)
- ◆ Shorted SCR
- ◆ Disconnect fault
- ◆ Inline contactor fault
- ◆ Control power low
- ◆ Stack over temperature
- ◆ Motor PTC input
- ◆ RTD modules

## Metering:

- ◆ +/- 2% accuracy (True RMS)
- ◆ Average current
- ◆ L1 current
- ◆ L2 current
- ◆ L3 current
- ◆ Current imbalance %
- ◆ Ground fault amps/residual
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## Metering, continued:

- ◆ L1 - L2 voltage
- ◆ L2 - L3 voltage
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- ◆ Overload %
- ◆ Power factor
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- ◆ Phase order
- ◆ Line frequency
- ◆ Analog input
- ◆ Analog output
- ◆ Run time - days
- ◆ Run time - hours
- ◆ # of starts
- ◆ Tru Torque %
- ◆ Power %
- ◆ Peak starting current
- ◆ Last starting duration
- ◆ Real-time clock

## 8 Digital Inputs Configurable to:

- ◆ Stop
- ◆ Fault
- ◆ Fault reset
- ◆ Bypass/confirmation & inline
- ◆ OL reset
- ◆ Local/remote selection
- ◆ Heater enable
- ◆ Heater disable
- ◆ Dual ramp selection
- ◆ 1 dedicated start input
- ◆ 1 dedicated bypass

## 6 Relay Outputs Configurable to:

- ◆ Starter off
- ◆ Faulted fail safe and non fail safe
- ◆ Running
- ◆ Up to speed
- ◆ Alarm condition
- ◆ Ready condition
- ◆ Locked out
- ◆ Over current trip
- ◆ Under current trip
- ◆ OL alarm
- ◆ Shunt trip fail safe and non fail safe
- ◆ Ground fault

## Relay Outputs, continued:

- ◆ Energy saver indication
- ◆ Heating indication
- ◆ Slow speed forward/reverse
- ◆ DC braking
- ◆ Cooling fan
- ◆ 1 fixed bypass

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- ◆ Current (0-200%/0-800%)
- ◆ Voltage (0-150%)
- ◆ OL (0-150%)
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## User Interface:

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## 1 Communication Port:

- ◆ ModBus RTU/Half Duplex
- ◆ RS485 (Isolated at 1,750 Vpk)
- ◆ Communication bridges:
  - Profibus
  - Ethernet
  - Devicenet
  - LON Works
  - Can Bus

## Advanced Functionality:

- ◆ Dual ramp selection
- ◆ Adjustable kick current
- ◆ Programmable decel modes
- ◆ LV BIST test (built-in self test)
- ◆ Event log (99 events)

## CONTROL FEATURE COMPARISON

| FUNCTION                               | MICRO II | EXISTING MX | NEW MX <sup>2</sup> | NEW MX <sup>3</sup> |
|--|----------|-------------|---------------------|---------------------|
| <b>SOFT STARTING AND STOPPING</b>      |          |             |                     |                     |
| Voltage Ramp                           |          | ✓           | ✓                   | ✓                   |
| Current Ramp                           | ✓        | ✓           | ✓                   | ✓                   |
| TruTorque Ramp                         | ✓        | ✓           | ✓                   | ✓                   |
| Power Ramp                             | ✓        | ✓           | ✓                   | ✓                   |
| Tach/Speed Control Ramp                | ✓        |             |                     | ✓                   |
| Linear Ramp Profiles                   | ✓        | ✓           | ✓                   | ✓                   |
| Squared and S Ramp Profiles            |          |             |                     | ✓                   |
| Dual Ramps                             | ✓        | ✓           | ✓                   | ✓                   |
| Kicking                                | ✓        | ✓           | ✓                   | ✓                   |
| Voltage Decel                          | ✓        | ✓           | ✓                   | ✓                   |
| TruTorque Decel                        | ✓        | ✓           | ✓                   | ✓                   |
| DC Braking                             | ✓        |             | ✓                   | ✓                   |
| Heater/Antiwindmill                    | ✓        | ✓           | ✓                   | ✓                   |
| Slow Speed 7-14%                       | ✓        |             | ✓                   | ✓                   |
| Slow Speed CYCLO Operation 0-40% speed |          |             | *                   | ✓                   |
| Inside Delta                           | ✓        | ✓           | ✓                   | ✓                   |
| Wye-Delta/Electromechanical Control    |          | ✓           | ✓                   | ✓                   |
| Phase Controller                       |          | ✓           | ✓                   | ✓                   |
| Current Follower                       |          | ✓           | ✓                   | ✓                   |
| ATL                                    | ✓        | ✓           | ✓                   | ✓                   |

|  |   |   |   |   |
|--|---|---|---|---|
| <b>PROTECTION</b>                          |   |   |   |   |
| Separate Starting/Running Overload Classes |   | ✓ | ✓ | ✓ |
| Adj. Hot/Cold Ratio                        |   | ✓ | ✓ | ✓ |
| Adj. Cooling Time                          |   | ✓ | ✓ | ✓ |
| Intelligent Start Lockout                  |   |   |   | ✓ |
| Adj. OL Lockout Level                      |   |   |   | ✓ |
| Over/Under Current Protection              | ✓ | ✓ | ✓ | ✓ |
| Retained OL When Power Lost                | ✓ |   | ✓ | ✓ |
| Current Imbalance Protection               | ✓ | ✓ | ✓ | ✓ |
| IOC (Instantaneous Over Current)           | ✓ | ✓ | ✓ | ✓ |
| Open/Shorted SCR Detection                 | ✓ | ✓ | ✓ | ✓ |
| Overcurrent/Shear Pin                      | ✓ | ✓ | ✓ | ✓ |
| Undercurrent/Load Loss                     | ✓ | ✓ | ✓ | ✓ |
| Residual Ground Fault Protection           | ✓ | ✓ | ✓ | ✓ |
| Zero Sequence Ground Fault Protection      |   |   |   | ✓ |
| Starts Per Hour                            | ✓ |   |   | ✓ |
| RTD Monitoring                             | ✓ |   |   | ✓ |
| Motor PTC                                  |   |   |   | ✓ |
| Stack OT Switch                            | ✓ | ✓ | ✓ | ✓ |
| Stack Thermistor Input                     |   |   | ✓ | ✓ |
| Backspin Timer                             | ✓ |   |   | ✓ |
| Time Between Starts                        | ✓ |   |   | ✓ |
| Phase Rotation                             | ✓ | ✓ | ✓ | ✓ |
| Overvoltage                                | ✓ | ✓ | ✓ | ✓ |
| Undervoltage                               | ✓ | ✓ | ✓ | ✓ |
| Phase Loss                                 | ✓ | ✓ | ✓ | ✓ |
| UTS/Stall Timer                            | ✓ | ✓ | ✓ | ✓ |

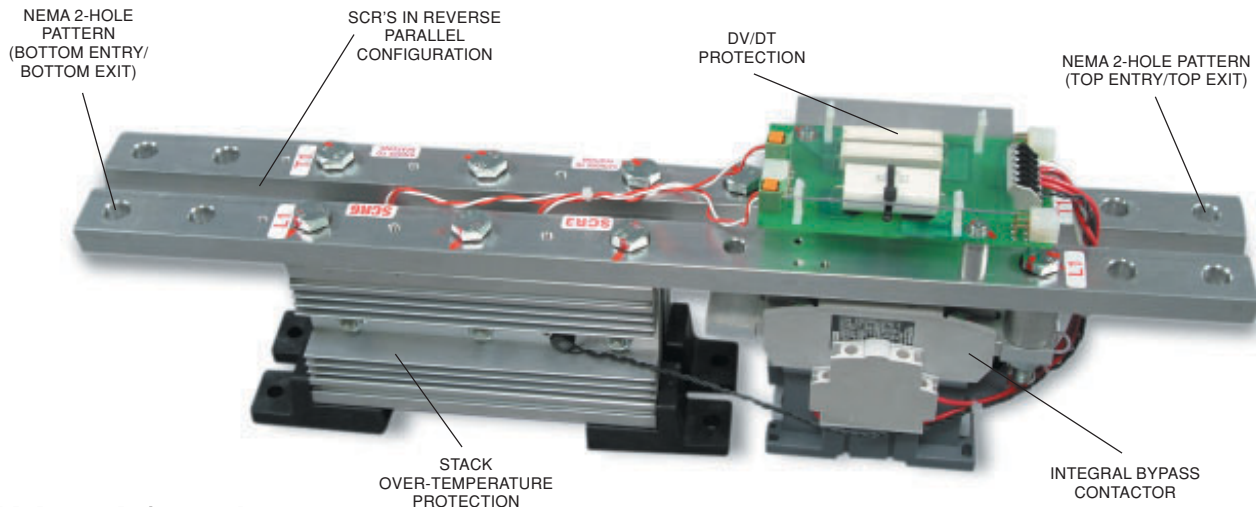
## CONTROL FEATURE COMPARISON

| FUNCTION                                  | MICRO II | EXISTING MX | NEW MX <sup>2</sup> | NEW MX <sup>3</sup> |
|---|----------|-------------|---------------------|---------------------|
| <b>PROTECTION, continued</b>              |          |             |                     |                     |
| Zero Speed Switch                         | ✓        |             |                     | ✓                   |
| PF Trip                                   | ✓        |             |                     | ✓                   |
| PORT (Power Outage Ride Through)          | ✓        |             |                     | ✓                   |
| Keypad Fault Reset                        |          | ✓           | ✓                   | ✓                   |
| Adj. Auto Fault Reset Timer               |          | ✓           | ✓                   | ✓                   |
| Adj. Number of Auto Resets Before Lockout | ✓        |             | ✓                   | ✓                   |
| Decel After Fault                         |          | ✓           | ✓                   | ✓                   |
| Fault Log                                 | ✓        | ✓           | ✓                   | ✓                   |
| Time and Date Stamp                       | ✓        |             |                     | ✓                   |
| 9 Data Snapshots of Each Fault            |          |             | ✓                   | ✓                   |
| Event Log (last 99 events)                | ✓        |             |                     | ✓                   |
| Fault Classes                             | ✓        |             |                     |                     |
| <b>USER I/O</b>                           |          |             |                     |                     |
| Programmable Digital Inputs               |          | ✓           | ✓                   | ✓                   |
| Programmable Digital Outputs              | ✓        | ✓           | ✓                   | ✓                   |
| User Analog Input                         |          | ✓           | ✓                   | ✓                   |
| Programmable User Analog Output           |          | ✓           | ✓                   | ✓                   |
| Local/Remote Source Input                 |          | ✓           | ✓                   | ✓                   |
| Power Up Start                            | ✓        |             | ✓                   | ✓                   |
| <b>METERING</b>                           |          |             |                     |                     |
| Full Voltage and Current Metering         | ✓        | ✓           | ✓                   | ✓                   |
| True RMS Calculation                      |          | ✓           | ✓                   | ✓                   |
| Factory Menu Calibration                  | ✓        | ✓           | ✓                   | ✓                   |
| Current Imbalance Meter                   | ✓        | ✓           | ✓                   | ✓                   |
| Ground Fault Meter                        | ✓        | ✓           | ✓                   | ✓                   |
| Watt Meters                               | ✓        | ✓           | ✓                   | ✓                   |
| KVA Meters                                | ✓        | ✓           | ✓                   | ✓                   |
| VAR Meter                                 | ✓        | ✓           | ✓                   | ✓                   |
| Watt Hour Meters                          | ✓        | ✓           | ✓                   | ✓                   |
| Line Frequency Meter                      | ✓        | ✓           | ✓                   | ✓                   |
| Power Factor Meter                        | ✓        | ✓           | ✓                   | ✓                   |
| % OL Meter                                | ✓        | ✓           | ✓                   | ✓                   |
| Time Until OL Lockout Release Meter       |          |             | ✓                   | ✓                   |
| Phase Rotation Meter                      |          | ✓           | ✓                   | ✓                   |
| % Power and % TruTorque Meter             | ✓        | ✓           | ✓                   | ✓                   |
| Run Time Meter                            | ✓        | ✓           | ✓                   | ✓                   |
| Number of Starts Meter                    | ✓        | ✓           | ✓                   | ✓                   |
| Peak Current of Last Start Meter          |          |             | ✓                   | ✓                   |
| Last Starting Time Meter                  |          |             | ✓                   | ✓                   |
| Analog Input Meter                        |          | ✓           | ✓                   | ✓                   |
| Real Time Clock                           | ✓        |             |                     | ✓                   |
| RTD Meters                                |          |             |                     | ✓                   |
| <b>MISCELLANEOUS</b>                      |          |             |                     |                     |
| LV BIST                                   |          |             | ✓                   | ✓                   |
| MV BIST                                   | ✓        |             | ✓                   | ✓                   |
| LV Powered BIST                           |          |             | ✓                   | ✓                   |

# Open Chassis Starters with Integral Bypass



**RB SERIES WITH NEW MX<sup>2</sup> TECHNOLOGY (ALSO AVAILABLE WITH MX<sup>3</sup> TECHNOLOGY)**  
 RUGGED INDUSTRIAL SOLID STATE STARTERS WITH INTEGRAL BYPASS



RB Power Pole - 180A

## RB Series Product Highlights:

Benshaw's RB series solid state starter combines the high performance MX<sup>2</sup> or MX<sup>3</sup> technology with a rugged, compact, integral bypass RB series power section.

The MX<sup>2</sup> or MX<sup>3</sup> technology provides users with a powerful group of programming parameters, designed for flexibility in across a wide range of industrial applications. Both MX<sup>2</sup> and MX<sup>3</sup> controls provide simple setup and commissioning via the Quick Start Menu.

The RB power section is a rugged, heavy duty solid state starter section designed with integral bypass contactors for a compact, efficient profile. The modular design includes separate poles for each phase for ease of maintenance.

### Key Advantages:

- ◆ Small, compact design
- ◆ Modular power stack assembly for ease of maintenance
- ◆ ModBus standard / other Fieldbus optional
- ◆ Multiple starting ramps for various applications
- ◆ Integrated metering system diagnostics
- ◆ Integral bypass contactors for efficient operation, eliminating the need for external fans
- ◆ Integrated motor protection
- ◆ Dual ramp capability for loaded / unloaded applications
- ◆ Power stack has multiple ratings for application flexibility

### Guaranteed ... for three full years.

**Only Benshaw has a three year guarantee.**

Every Benshaw open chassis low voltage starter is guaranteed for three full years. Other manufacturers limit their warranties to just one year. But at Benshaw, we believe that, because we build them better, we can guarantee them longer. We call that "the Benshaw Promise."





# Open Chassis Starters Non Bypassed / Continuous Duty

Also  
available  
with MX<sup>3</sup>  
control



**RC SERIES WITH NEW MX<sup>2</sup> OR MX<sup>3</sup> TECHNOLOGY**  
RUGGED INDUSTRIAL SOLID STATE STARTERS  
1 - 1200 HP / 208 - 600 VAC

## RC Series Product Highlights:

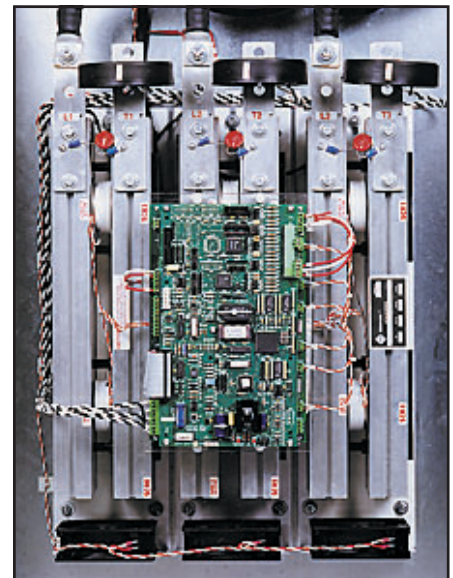
The RC Series Solid State Starter combines the high performance MX<sup>2</sup> or MX<sup>3</sup> control with the rugged, continuous duty, fan cooled RC stack.

The MX<sup>2</sup> or MX<sup>3</sup> series control provides users with a powerful group of programming parameters, designed for flexibility in industrial applications. The MX<sup>2</sup> and MX<sup>3</sup> both provide simple setup and commissioning via the Quick Start Menu.

The RC power section is a rugged non-bypassed section. It is an economical solution at low horsepower. In addition, the fan cooled stack provides high duty cycle and high inertia starting and energy saver operation.

### Key Advantages:

- ◆ Economical at low horsepower
- ◆ High duty cycle starting
- ◆ Long starting times
- ◆ Suitable for jogging applications
- ◆ Fan cooled stack
- ◆ Energy saver applications
- ◆ Integrated motor protection
- ◆ ModBus standard / Profibus, Ethernet, DeviceNet, LON Works, Ethernet IP web addressable communication protocols are available via optional communication bridges
- ◆ 1.25 service factor
- ◆ Integrated metering and diagnostics
- ◆ Multiple starting ramps for various applications



## Guaranteed ... for three full years.

*Only Benshaw has a three year guarantee.*

Every Benshaw solid state starter is guaranteed for three full years. Other manufacturers limit their warranties to just one year. But at Benshaw, we believe that, because we build them better, we can guarantee them longer. We call that "the Benshaw Promise."



# Open Chassis Starters with Integral Bypass

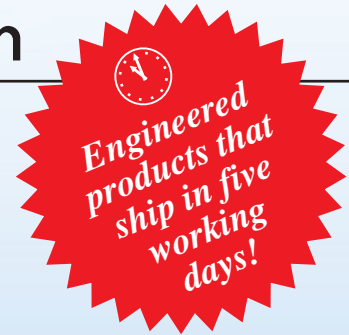
## RB2 SERIES

### PRODUCT SELECTION GUIDE

|  | MODEL NUMBER     | HORSEPOWER |      |      |      | DIMENSIONS (IN) |      |      |
|--|------------------|------------|------|------|------|-----------------|------|------|
|  |                  | 208V       | 240V | 480V | 575V | H               | W    | D    |
| <b>STANDARD DUTY</b><br>350% for 30 sec<br>115% continuous | RB2-1-S-027A-11C | 7.5        | 10   | 20   | 25   | 14              | 10   | 6.9  |
|  | RB2-1-S-040A-11C | 10         | 15   | 30   | 40   | 14              | 10   | 6.9  |
|  | RB2-1-S-052A-12C | 15         | 20   | 40   | 50   | 14              | 10   | 6.9  |
|  | RB2-1-S-065A-12C | 20         | 25   | 50   | 60   | 14              | 10   | 6.9  |
|  | RB2-1-S-077A-13C | 25         | 30   | 60   | 75   | 15              | 10   | 7.7  |
|  | RB2-1-S-096A-13C | 30         | 40   | 75   | 100  | 15              | 10   | 7.7  |
|  | RB2-1-S-125A-14C | 40         | 50   | 100  | 125  | 21.6            | 12.3 | 8.9  |
|  | RB2-1-S-156A-14C | 50         | 60   | 125  | 150  | 21.6            | 12.3 | 8.9  |
|  | RB2-1-S-180A-14C | 60         | 75   | 150  | 200  | 21.6            | 12.3 | 8.9  |
|  | RB2-1-S-240A-15C | 75         | 100  | 200  | 250  | 22              | 12.3 | 9.2  |
|  | RB2-1-S-302A-15C | 100        | 125  | 250  | 300  | 22              | 12.3 | 9.2  |
|  | RB2-1-S-361A-16C | 125        | 150  | 300  | 400  | 23.9            | 12.9 | 9.2  |
|  | RB2-1-S-414A-17C | 150        | -    | 350  | -    | 28.3            | 18.5 | 11.3 |
|  | RB2-1-S-477A-17C | -          | 200  | 400  | 500  | 28.3            | 18.5 | 11.3 |
|  | RB2-1-S-515A-17C | 200        | -    | 450  | -    | 28.3            | 18.5 | 11.3 |
| RB2-1-S-590A-18C   | -                | 250        | 500  | 600  | 28.3 | 18.5            | 11.3 |      |
| RB2-1-S-720A-19C   | 250              | 300        | 600  | 700  | 29.4 | 18.5            | 11.3 |      |
| RB2-1-S-838A-20C   | 300              | 350        | 700  | 800  | 27.8 | 26.6            | 12.9 |      |
| <b>HEAVY DUTY</b><br>500% for 30 sec<br>125% continuous    | RB2-1-S-027A-11C | 7.5        | 10   | 20   | 25   | 14              | 10   | 6.9  |
|  | RB2-1-S-040A-11C | 10         | 15   | 30   | 40   | 14              | 10   | 6.9  |
|  | RB2-1-S-052A-12C | 15         | 20   | 40   | 50   | 14              | 10   | 6.9  |
|  | RB2-1-S-096A-13C | 30         | 40   | 75   | 100  | 15              | 10   | 7.7  |
|  | RB2-1-S-156A-14C | 40         | 50   | 100  | 125  | 21.6            | 12.3 | 8.9  |
|  | RB2-1-S-180A-15C | 60         | 75   | 150  | 200  | 22              | 12.3 | 8.9  |
|  | RB2-1-S-361A-16C | 75         | 100  | 200  | 250  | 23.9            | 12.9 | 9.2  |
|  | RB2-1-S-414A-17C | 125        | 150  | 300  | 400  | 28.3            | 18.5 | 11.3 |
|  | RB2-1-S-590A-18C | 200        | 200  | 450  | 500  | 28.3            | 18.5 | 11.3 |
|  | RB2-1-S-720A-19C | -          | 250  | 500  | 600  | 29.4            | 18.5 | 11.3 |
| <b>SEVERE DUTY</b><br>600% for 30 sec<br>125% continuous   | RB2-1-S-027A-11C | 5          | 7.5  | 15   | 20   | 14              | 10   | 6.9  |
|  | RB2-1-S-040A-11C | 10         | 10   | 30   | 40   | 14              | 10   | 6.9  |
|  | RB2-1-S-052A-12C | -          | 15   | -    | -    | 14              | 10   | 6.9  |
|  | RB2-1-S-096A-13C | 25         | 30   | 60   | 75   | 15              | 10   | 7.7  |
|  | RB2-1-S-180A-15C | 30         | 40   | 75   | 100  | 21.6            | 12.3 | 8.9  |
|  | RB2-1-S-180A-15C | 50         | 60   | 125  | 150  | 21.6            | 12.3 | 8.9  |
|  | RB2-1-S-361A-16C | 60         | 75   | 150  | 200  | 23.9            | 12.9 | 9.2  |
|  | RB2-1-S-414A-17C | 100        | 125  | 250  | 300  | 28.3            | 18.5 | 11.3 |
| RB2-1-S-590A-18C   | 150              | 200        | 450  | 500  | 28.3 | 18.5            | 11.3 |      |

# PREDATOR™ QuickShip Program

## FOR LOW VOLTAGE SOLID STATE STARTERS



Benshaw's PREDATOR™ QuickShip program allows you to custom configure a wide range of low voltage solid state starters for shipment within five working days A.R.O. Simply choose a PREDATOR-QUALIFIED starter from the Engineered Products section of this catalog, then add PREDATOR-QUALIFIED options, as needed. Benshaw will build and ship your custom configured starter within five working days!

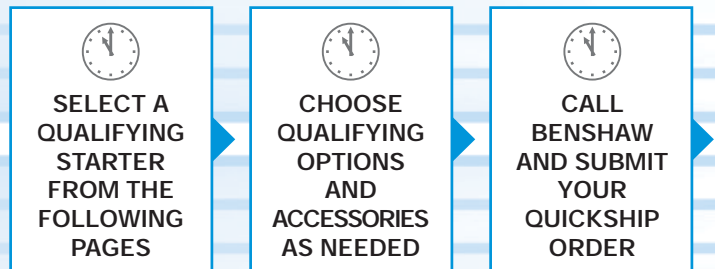
### QuickShip Starter Features:

- ◆ Non-combination or combination circuit breaker
- ◆ NEMA 1, 12 or 3R enclosed
- ◆ Input voltage 208-600V
- ◆ Starter sizes 70-1500 amp
- ◆ UL listed
- ◆ MX<sup>2</sup> or MX<sup>3</sup> technology
- ◆ Bypassed

### QuickShip Options:

- ◆ Start-Stop pushbuttons or switch
- ◆ On-Off pushbuttons or switch
- ◆ Hand-off auto selector switch
- ◆ Local off remote switch
- ◆ Standard VA control power transformer
- ◆ Auxiliary control power transformer 1, 2, 3KVA
- ◆ Power factor correction
- ◆ Shunt trip on main circuit breaker
- ◆ Power on light
- ◆ Run light
- ◆ Door mounted keypad
- ◆ Surge/lightning arrestor
- ◆ Auxiliary full voltage starter
- ◆ Metering CT
- ◆ Auxiliary full voltage starter

## PRE-ENGINEERED REAL-TIME ENGINEERING DATABASE



## AUTOMATED TURNKEY ORDER RELEASE

INDEX

### TYPICAL ENGINEERED PRODUCT WORKFLOW

### AVERAGE 8-10 WORKING DAYS



ORDER ENTRY

ENGINEERING

PURCHASING

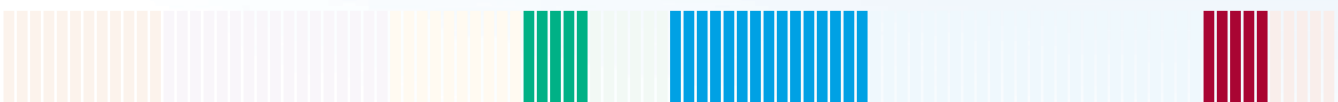
MATERIAL CONTROL

MANUFACTURING

QA/ TESTING

### PREDATOR™ QUICK SHIP WORKFLOW

### 5 WORKING DAYS



# Prepackaged Starters with ATL Bypass Severe Duty



## REDISTART RX2E SERIES + RX3E

NEMA 12 / COMBINATION / DUAL REDUNDANT



### Standard Features:

- ◆ NEMA 12, dual redundant, combination/circuit breaker
- ◆ Shunt trip on main circuit breaker
- ◆ 500% - 30 seconds rated solid state starter, UL certified and listed
- ◆ 1800 PIV rated SCRs, UL certified and listed
- ◆ 125% continuous duty rated solid state starter, UL certified and listed
- ◆ Selector switch for selecting solid state or full voltage operation mounted inside enclosure
- ◆ Full HP rated bypass contactor with a 1.15 service factor, wired for normal bypass operation and full voltage start and run operation, with normally open auxiliary contact.
- ◆ Separately mounted "SPE" series overload relay wired for full voltage start and run operation.
- ◆ 110 volt control power transformer with primary and secondary fuses
- ◆ Door mounted start and stop push-buttons
- ◆ Door mounted keypad
- ◆ Door mounted run indicating light
- ◆ Door mounted local-off remote switch
- ◆ Door mounted overload reset
- ◆ Terminal strip mounted inside enclosure for remote start/stop connection
- ◆ Auxiliary relay with (2) Form C run contacts
- ◆ Benshaw MX<sup>2</sup> programmable motor controller with soft start, soft stop and motor protection capabilities
- ◆ RS485 ModBus communications
- ◆ Analog I/O
- ◆ Available with MX<sup>3</sup> technology

### RX2E Series Product Highlights:

RX2E starters provide solid state reduced voltage starting for normal operation and full voltage emergency backup starting with complete electronic motor protection at the flip of a switch. This unique dual redundant design is the ideal solution for critical applications where downtime is extremely disruptive to production operations and cannot

be tolerated. Benshaw's MX solid state controls provide precise digital starting and stopping, motor protection, metering, diagnostics and communications ... standard.

Units are stocked with MX<sup>2</sup> technology, but are also available with MX<sup>3</sup> technology.

**Rugged. Reliable. Ready.**

### Guaranteed ... for three full years.

**Only Benshaw has a three year guarantee.**

Every Benshaw solid state starter is guaranteed for **three full years**. Other manufacturers limit their warranties to just one year. But at Benshaw, we believe that, because we build them better, we can guarantee them longer. We call that "the Benshaw Promise."



# Prepackaged Starters Non-Bypassed / Continuous Duty and Integral Bypass

## MX2PB / MX2PC SERIES

PREPACKAGED STARTERS WITH NEW MX<sup>2</sup> TECHNOLOGY  
MODIFIED FOR NEXT DAY SHIPMENT



*Configure the  
MXPB / MXPC to  
fit your application ...*

To choose a stock starter, simply select a unit from the following price pages.  
To modify a starter, select a unit from the following price pages, then add an alpha board and/or other options as needed from the *Options* section ... Benschaw will modify the stock unit for next day shipment.

*MX2PB / MX2PC  
configurable solid state  
starters are stocked as:*

- ◆ Non-combination
- ◆ Combination circuit breaker
- ◆ Rotary disconnect operator
- ◆ Non-bypass
- ◆ Bypass contactor
- ◆ NEMA 4 or 12 enclosure
- ◆ Modular operator station
- ◆ 480 volt
- ◆ Standard 120V control power transformer

- 1.** Select a starter type:
  - MX2PC modular non-bypass or
  - MX2PB modular bypassed

**2.** Select a horsepower rating

**3.** Select a voltage

**4.** Select an enclosure

**5.** Select a circuit breaker (or none)

**6.** Select your options



+



=



# Engineered Packages

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## PRODUCT OVERVIEW

Benshaw has developed advanced engineering, drafting, materials management and quality systems focused on designing and building customer solutions. This “Build to Order” capability combined with an extensive inventory of control components, protective relays, circuit breakers, contactors, enclosures and other electrical / electronic devices provides our customers with the quickest shipment of engineered products in the industry.

### *Control Modifications - Whatever You Specify*

- ◆ Over 250 modifications and accessories are available, including: pilot devices, PLC's, control power transformers, switches, meters, relays, space heaters, and protective devices.

### *Combination Starters to Meet Your Requirements*

- ◆ 15 to 2000 amp circuit breakers
- ◆ 40 to 2000 amp non-fused disconnects
- ◆ 30 to 800 amp fusible disconnect
- ◆ Flange or rotary handle mechanism

### *Power Stacks to Fit Your Application*

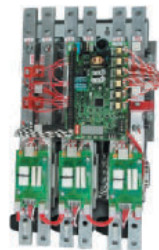
- ◆ Continuous duty / non-bypassed
- ◆ Integral bypass
- ◆ Standard, heavy, and severe duty
- ◆ Emergency across-the-line bypass

### *Enclosures to Match Your Environment*

- ◆ Standard designs - NEMA 1, 12, 4 chassis
- ◆ Custom enclosures
- ◆ Special enclosures - 3R, 4X, 7, 9, as specified
- ◆ Motor control centers

### *Communication Modules to Match Your Network*

- ◆ ModBus / RS485
- ◆ Ethernet
- ◆ Devicenet
- ◆ Profibus
- ◆ IP Internet Web Addressable
- ◆ LON Works
- ◆ Custom interfaces



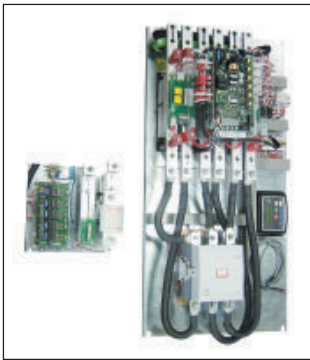
For additional options - contact factory

# For Any Application

## APPLICATION SPECIFIC STARTERS OVERVIEW

Benshaw is the trusted expert for any AC motor application. Benshaw provides a full line of application solutions for reversing motors, DC injection braking, wound rotor motors, two speed motors, synchronous motors and more.

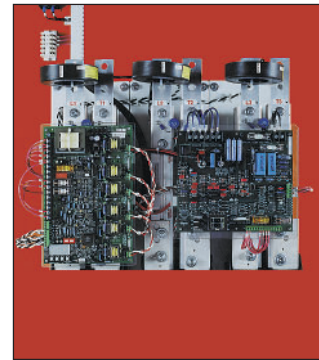
*Call for price and availability*



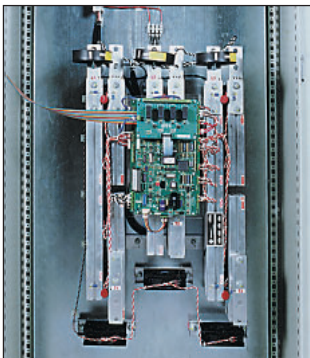
SOLID STATE STARTERS WITH DC INJECTION BRAKING



REVERSING SOLID STATE STARTERS



SYNCHRONOUS SOLID STATE STARTERS



TWO SPEED SOLID STATE STARTERS



SOLID STATE STARTERS FOR WOUND ROTOR MOTORS



**BENSHAW Inc.**  
World Headquarters  
Glenshaw, PA



**BENSHAW Canada**  
Canadian Headquarters  
Listowel, ON.



**BENSHAW Inc.**  
Plant 2 Manufacturing  
Glenshaw, PA



**BEN-Fab**  
Custom Fabrication  
Waterloo, ON.



**BENSHAW West**  
Western Operations  
Scottsdale, AZ.



**BENSHAW Pueblo**  
Trane Division  
Pueblo, CO



**BEN-Tech**  
Industrial Automation  
Rochester Hills, MI



**BENSHAW High Point**  
EPC Division  
High Point, NC

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Guayaquil, Ecuador

### Mexico

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**Australia**  
**Singapore**

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Fax: (480) 905-0757

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Fax: (336) 434-9682

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Phone: (251) 443-5911  
Fax: (251) 443-5966

### BENSHAW Pueblo

Trane Division  
1 Jetway Court  
Pueblo, CO 81001  
Phone: (719) 948-1405  
Fax: (719) 948-1445

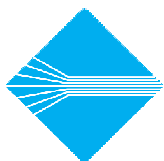
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Fax: (519) 291-2595

### BENSHAW Canada West

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BCAM-06-007-01



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