Benshaw EMX4e Softstarters

Benshaw EMX4 series soft starters (EMX4e shown) feature a built-in keypad and display for easy setup and monitoring.

Introduction

The **Benshaw EMX4e** is a low-voltage solid-state soft starter designed to provide smooth AC motor control and advanced protection in a cost-effective package [1]. As the "smaller brother" to Benshaw's full-featured EMX4i series, the EMX4e delivers all essential soft start functions for motors up to 580 A (approximately 5–400 HP) in a compact, chassis-style unit [2] [1]. It incorporates built-in bypass contactors and intelligent control algorithms to gradually ramp motor voltage, reducing the mechanical stresses and electrical surges associated with across-the-line starting [3] [4]. By controlling startup and shutdown, the EMX4e helps extend equipment lifespan, minimize downtime, and improve overall system reliability. This overview will explore the EMX4e's key features, technical specifications, and real-world application benefits, illustrating how this soft starter can solve common motor starting challenges.

Smooth Motor Control & Starting Modes

One of the core functions of the EMX4e is **controlled motor acceleration and deceleration**. Instead of subjecting the motor to full inrush current at startup (which can be 4–7× the rated current in a direct-on-line start [5]), the EMX4e gradually increases voltage to the motor. This **voltage ramp-up** (phase-angle control of SCRs) limits inrush current and excessive torque, preventing the sudden mechanical shock of across-the-line starts [6] [7]. The EMX4e supports *three selectable starting modes*: **Constant Current Start**, **Current Ramp Start**, and **Adaptive Control Start**. In a constant current or current ramp start, the user sets a current limit and/or ramp profile so the motor current smoothly rises to full load over an adjustable time [8]. This avoids torque spikes and voltage dips on the supply, thereby mitigating light flicker and bus voltage sags in the facility [9]. By reducing starting stress on couplings, gears, and belts, these soft start modes directly help preserve motor and machine components [4].

In addition, the EMX4e features **Adaptive Acceleration Control**, an advanced algorithm that automatically adjusts the voltage ramp to match the load's dynamics [10]. This mode (branded "XLR-8" by the soft starter's original developer) actively modulates motor torque during start and stop to achieve a user-defined ramp time, learning from each start/stop cycle [11] [12]. The benefit of adaptive control is especially evident in pumping applications or high-inertia loads. For example, when starting a centrifugal pump, a standard voltage ramp can still produce a surge of torque at the end of the ramp (as the motor reaches full speed), potentially causing a pressure spike or *water hammer* in pipelines [13] [10]. With the EMX4e's adaptive control, the soft starter carefully regulates torque throughout the acceleration, avoiding any sudden change as full speed is approached. The result is a smooth pump start with **minimal pressure surges**, protecting pipes and valves from the damaging effects of water hammer [10] [14]. Similarly, during stopping, the EMX4e can perform a soft stop by ramping down the voltage (or torque) to decelerate the pump gradually, preventing the abrupt flow reversal and pressure spike that occur if a pump is stopped "coast-to-stop" [15] [14]. This **pump control** capability is a major advantage in fluid handling systems – it can **virtually**

eliminate water hammer, as documented in industrial case studies where soft starters replaced across-the-line starters and immediately reduced pressure transients and maintenance issues in pumping stations [16] [17].

For standard industrial machinery, the EMX4e's soft start also means a gentler mechanical engagement. Conveyor belts come up to speed without jerk, reducing material slippage and wear on belts. Fans and compressors avoid the sudden torque that can strain shafts or suddenly pressurize systems. In HVAC systems, for instance, soft starters have been used on large chillers and blower fans to **avoid abrupt mechanical and electrical stress**, leading to more reliable climate control and lower peak demand on the electrical system [18]. Overall, by offering configurable ramp profiles and **precise control over the motor's voltage application**, the EMX4e ensures that motors start and stop **smoothly and safely**, which in turn increases uptime and reduces maintenance needs on connected equipment.

It's worth noting that while the EMX4e excels at controlled starting of fixed-speed motors, it is not a variable frequency drive – once the motor reaches full speed, the EMX4e's internal bypass contactor closes, and the motor runs directly on line power [3]. This design yields **99.5% efficiency during run** (essentially no voltage drop across the bypass) and imposes no harmonic distortion on the power line [19] [20]. Unlike a VFD, a soft starter does not offer speed control under normal operation; however, for applications where full-speed operation is acceptable, soft starters provide a much more economical and efficient solution. They **run cool** (since the SCRs are bypassed at full voltage, generating negligible heat) and avoid the need for costly input filters or shielded cabling, which are often required with VFDs to manage high-frequency harmonics [21] [22]. Unless variable speed is needed for process control, a soft starter like the EMX4e is often the preferred choice for simply reducing start/stop stress at lower cost and complexity [17]. In summary, the EMX4e's suite of starting and stopping modes – from basic ramps to adaptive control – equips it to handle a wide range of motor applications with optimal smoothness and minimal impact on both the mechanical system and the electrical supply.

Motor Protection & Reliability Features

Beyond controlling acceleration, the EMX4e also functions as a **comprehensive motor protection device**. It continuously monitors key parameters (current, voltage, temperature via thermistor, etc.) and can trip to protect the motor and driven equipment from abnormal conditions. The built-in electronic **motor overload protection** follows an inverse-time trip curve similar to a thermal overload relay, shutting down the motor if it draws excessive current for too long. The EMX4e's protection suite includes safeguards against **phase loss**, **phase imbalance**, and **phase reversal (wrong phase sequence)**] [23] **– all conditions that can severely damage a three-phase motor. If any phase of the supply is lost or significantly unbalanced, the soft starter will detect it and inhibit operation to prevent motor overheating or single-phasing. Under/over-current protection is also provided: for example, if the motor is running with no load (drawing unusually low current) or if it stalls drawing locked-rotor current, the EMX4e can trip to stop the motor and alert the operator [23]. This can be vital in applications like pumping: a** dry-run (underload) **trip can save a pump from running without fluid, and an** overcurrent** trip can prevent a jammed pump or conveyor from burning up the motor.

While the EMX4e's standard model does not measure supply voltage for under/over-voltage trips (that feature is in the EMX4i), it **accepts a motor thermistor input** (PTC sensor from the motor windings) to directly monitor motor temperature [24]. If the motor overheats (thermistor resistance rises above the trip threshold), the soft starter will fault out to protect the insulation from thermal damage. This offers more

precise thermal protection than current alone in cases of cooling loss or high ambient temperature. The unit also includes a feature called **"trip fail safe"**, meaning the fault relay can be wired normally energized so that any loss of control power or internal failure causes it to de-energize (ensuring the motor contactor drops out for safety) [23] . In essence, the EMX4e is designed with a fail-safe philosophy to default to a safe state on fault conditions.

For high reliability and critical applications, the EMX4e provides an **Emergency Run (Fire Mode)** capability. When activated (by a digital input or parameter), **Emergency Mode** will force the soft starter to keep the motor running regardless of trip conditions [25] . All protective trips are ignored so that the motor can continue to operate during an emergency (for example, driving a fire pump or exhaust fan during a fire). This mode is intended only for true emergencies – it ensures the motor will run to destruction if necessary to fulfill a life-safety function. The EMX4e's manual explicitly cautions that using emergency mode continuously can **damage the starter/motor and void the warranty**, since it bypasses all overload and fault protection [26] . However, this feature can be a lifesaver in situations where stopping the motor is not an option. Once the emergency override is removed or the motor is stopped, the soft starter returns to normal protective operation.

From a hardware standpoint, the EMX4e is built for robustness. It uses heavy-duty SCRs (thyristors) on each phase to handle the high starting currents, and its **integrated bypass contactor** not only improves efficiency but also extends the life of the SCRs by removing steady-state load. The device is rated for **Type 2 coordination** with fuses – when protected by semiconductor fuses, it can withstand high prospective short-circuit currents without catastrophic damage [27] . In practice, this means that if a severe short occurs on the motor side, the fuses will clear the fault and the soft starter should survive (or at least not pose a danger), which reduces downtime and repair costs. The EMX4e is **UL listed and CE marked**, meeting the IEC/EN 60947-4-2 standard for low-voltage motor controllers [28] . It also carries **cUL certification** (for Canadian standards) and **CCC** certification for use in China [28] . Notably, it even has **marine approvals** (Lloyd's Register and ABS), indicating it passed stringent vibration, humidity, and thermal tests for use on ships [29] . These approvals speak to the build quality – the unit can reliably function in harsh industrial and marine environments. Operating temperature is rated from **-10°C to +60°C**, with full current available up to 40°C ambient and derating required above that [30] . The design conforms to **Pollution Degree 3** and is available with up to **IP20 protection** (finger-safe) on smaller sizes, or **IP00 open chassis** for larger frames that will be mounted in an electrical cabinet [31] . All of this means the EMX4e is engineered for long-term reliability in the field. In real-world use, Benshaw (and its partner AuCom) have a strong track record – for example, aggregate mining plants using previous generations of these soft starters report **improved motor life and "excellent results" in protection**, with one site maintenance manager stating that these starters *"are 100% recommended"* after years of trouble-free service in critical crusher applications [32] [33] .

User Interface and Integration

Despite its sophisticated capabilities, the EMX4e is designed to be **user-friendly and easy to integrate** into control systems. It comes with a multi-language **graphical LCD display and keypad** on the front, providing an intuitive interface for configuration and monitoring [34] . The menu structure and quick-start setup wizards allow commissioning the soft starter with minimal hassle – users can program parameters such as ramp times, current limits, motor full-load current, and protection setpoints through plain-text menus. The **keypad** can display real-time operational data (like motor current, status, and any warnings) and has LED indicators for run, trip, and bypass status. The display is configurable, meaning you can choose what parameter to show (e.g. motor current, or maybe a custom text) during operation [34] . This local HMI

greatly simplifies troubleshooting: if a fault occurs, the LCD will show a descriptive fault message (not just a code), and the **event log** stored in memory provides a history of the last faults/trips. The EMX4e actually features a **real-time clock** and data logging ability – it time-stamps events like start/stop, faults, and measured values which can be retrieved via the USB port or displayed for diagnostics [23]. Having an onboard log means maintenance personnel can review what happened prior to a trip (e.g. current levels, supply frequency) to pinpoint issues faster, reducing downtime.

For programming or copying settings, the EMX4e includes a front-panel **USB port** [35] [36]. This allows connection to a PC to use configuration software or simply to download the starter's data. Operators can save a backup of the parameter set or clone the configuration into multiple starters – useful for OEMs who need to program many units identically. The USB port also facilitates firmware updates, ensuring the product can be kept up-to-date with the latest features and fixes from Benshaw/AuCom. In fact, the emphasis on ease-of-use extends to maintenance aids like **QR codes on the display** – the higher-end EMX4i model offers on-screen QR codes that link to online support resources [37], and the EMX4e shares the same basic platform. With a smartphone, a technician can scan a fault's QR code and instantly get troubleshooting guidance. AuCom (the technology provider behind EMX4 series) even offers a **mobile app ("Start Here")** that provides tools for troubleshooting and support in the field [38]. For example, the app can guide users through checking installation issues if a start is unsuccessful, or help interpret trip logs. These conveniences reflect a modern, **operator-centric design** that reduces the learning curve and time to resolve problems.

On the integration side, the EMX4e can seamlessly tie into plant control systems. It has several programmable digital inputs and outputs for common control schemes (e.g. two-wire or three-wire start/stop control, external trip interlocks, and status indication). Importantly, it offers a full range of **communication interface options** via plug-in modules. Available communication plug-in cards include **Modbus RTU (RS-485)**, **Modbus TCP/IP**, **Profibus-DP**, **Profinet**, **DeviceNet**, and **EtherNet/IP** [39]. With the appropriate module installed, the soft starter can be networked into a PLC/SCADA system, enabling remote start/stop commands, status monitoring, and parameter adjustments over the fieldbus. For instance, on an Ethernet/IP network in a factory, a central control system can read the motor current from the EMX4e, check if any alarms are present, or command a stop – all over the network without additional hardwiring. This flexibility to communicate on virtually any industrial protocol means the EMX4e can be integrated into both new and existing installations regardless of the control platform (Rockwell, Siemens, Schneider, etc.). Many high-end soft starters offer such connectivity, and the EMX4e matches industry expectations in this area, thereby protecting your investment as industrial communication standards evolve.

Another expansion capability is the use of **Smart Cards**. The EMX4e has a slot for an add-on smart card (one such card is the Pumping Smart Card) which can embed application-specific logic or features into the soft starter [40]. For example, the Pumping Smart Card provides enhanced pump control functions like **auto-pump cleaning** (a feature where upon stopping, the soft starter can execute a brief reverse rotation or agitation to clear blockages or sludge), multi-pump alternation control, and additional protections tailored to pumping systems. While some of these advanced functions (like Pump Clean or torque control) are standard on the EMX4i, the EMX4e can achieve them by plugging in the smart card, thus **upgrading its functionality** for specialized uses. This modular approach means you only pay for the extra features if you need them – keeping the base unit cost-optimized. The EMX4e also supports an optional **remote keypad/display** which can be panel-mounted (for when the starter itself is deep inside a cabinet). This remote HMI replicates the local display and keypad, allowing operators to control and program the soft starter from a

more convenient location (e.g. on a cabinet door) [41]. It's particularly useful if the starter is part of an OEM machine where the end-user needs access to start/stop or to view status without opening a panel.

In summary, the EMX4e's user interface and integration features are designed to make it as **easy to deploy and maintain** as possible. From the straightforward local controls and logging to the extensive network connectivity and expansion options, it can satisfy both small standalone system requirements and complex automated system integration. Technicians appreciate the clarity of the interface and the depth of diagnostic info available, which can significantly cut down on commissioning time and troubleshooting efforts. And for OEMs or plants standardizing on this starter, the ability to interface with virtually any control architecture provides **future-proof flexibility**.

Technical Specifications

The EMX4e soft starter comes in a range of models to cover various motor sizes and supply voltages. Below are key technical specifications and ratings for the Benshaw EMX4e series:

- **Motor FLA Range: 24 A to 580 A** (nominal continuous current) in standard duty ratings [42]. This corresponds roughly to motors from about 5 HP up to 400 HP, depending on voltage. All EMX4e units are intended for **Standard Duty** operation (approximately 350% FLC for 30 seconds, up to 4 starts per hour) [1]. Heavy-duty start ratings (e.g. 450% for 30s) are generally not applicable to the cost-optimized EMX4e models – those requirements would point to the EMX4i or an oversized unit [1].

- **Line Voltage:** Available in two voltage ranges: **200–525 VAC** (denoted by "V5" models) or **380–600 VAC** ("V7" models) [43]. This covers 208 V, 230 V, 480 V, and 575 V class systems commonly used in industry. The starter tolerates +10%/–15% variation on its rated line voltage, and works on **50 Hz or 60 Hz** supply (±5% frequency) automatically [43].

- **Control (Input) Voltage:** Two control supply options are offered, indicated by the C1 or C2 suffix in the model. **C1** models accept **110–120 VAC or 220–240 VAC** control power (they have dual winding input – wiring to different terminals selects the voltage) [44]. **C2** models use **24 VAC/VDC** low-voltage control supply [44]. For example, an EMX4e-0410B-V5-C1-H uses 110/240 VAC control, whereas a …-C2-H would use 24 V. Control power feeds the soft starter's internal electronics, digital inputs, and relay coils; it typically draws around 600 mA for AC or up to 2.8 A for 24 V DC (inrush) [44].

- **Internally Bypassed:** All EMX4e units come with an **integrated bypass contactor** built in [45]. Formally, they are classified as "semiconductor motor starters form 1" with bypass, meaning once the motor is at full speed the SCRs are bypassed by an internal contactor [46]. The internal bypass is rated for the full current and effectively carries the motor load during run, which drastically reduces heat dissipation in the starter.

- **Overload Rating:** As a standard duty soft starter, the EMX4e can handle **350% of its rated current for 30 seconds** (and 4 starts per hour) without tripping [47]. This typically aligns with accelerating normal loads like pumps, fans, and conveyors. If heavier starts (higher torque or more frequent starting) are needed, one may need to choose a larger model or use the EMX4i which supports a 450% for 30s heavy duty rating on many sizes [48] [49]. The EMX4e also enforces a **starts-per-hour**

limit and a **cool-down time** between starts (per IEC AC53b utilization codes) to protect the SCRs from overheating [50] [51].

- **Analog Output:** The unit provides an analog output (0–20 mA or 4–20 mA, user-configurable) proportional to a selected parameter (often motor current) [52]. This can be wired to a PLC or meter for real-time monitoring of motor load.

- **Relay Outputs:** There are typically three onboard relay outputs: one designated for the **main contactor** control (closes when soft starter is ready/running) [53], and two programmable relays for functions like Run indication, Trip indication, or Fault fail-safe. Each relay is rated ~5–10 A at 250 VAC [54].

- **Digital Inputs:** The EMX4e has several inputs (24 V active, ~8 mA) for Start, Stop, Reset commands and programmable functions (e.g. one can be set as an "Enable" or "External Trip" input) [55]. There is also a specific input for the **Emergency Run** trigger, as described earlier, and a thermistor input for motor overheating [56].

- **Environmental Ratings:** Operating ambient temperature is **-10°C to +60°C**; above 40°C, derating of output current is required (the manual provides a curve for reduced current at higher temps) [30]. Maximum installation altitude is **1000 m** without derating – above that, cooling and dielectric strength are affected, so a derating or higher capacity model is needed (up to 2000 m or more with derate) [57]. The soft starter is designed for **Pollution Degree 3** (industrial environments with non-conductive pollution) and relative humidity 5–95% (non-condensing) [58]. Vibration resistance meets IEC 60068-2-6, and the larger units are typically panel-mounted with additional support if needed to withstand shock.

- **Enclosure & Size:** The smaller frame sizes (EMX4e up to ~135A) have an **IP20 finger-safe** plastic cover over live terminals [31]. Larger sizes (184A and above) are **IP00 open chassis**, meaning bus bars or terminals are exposed and the unit must be mounted inside an electrical enclosure for safety [31]. Physically, the EMX4e units are compact for their ratings. For example, a 240 A unit (approx 200 HP @ 460 V) measures about **20.6 in tall × 8.5 in wide × 9.6 in deep**, weighing ~34 lbs [59] [60]. This relatively small footprint simplifies retrofitting into existing MCCs or wall-mount panels.

- **Compliance and Certification:** The EMX4e is **UL 60947-4-2 listed** (Low Voltage Soft Starter standard) and **CSA certified**, making it acceptable for use in North America [61]. It also carries the **CE mark**, meeting the EU Low Voltage and EMC Directives – specifically tested to **IEC/EN 60947-4-2** for AC semiconductor motor controllers [62]. EMC performance is rated **Class B** emissions (EN 60947-4-2), which is actually stringent (suitable even for residential grid connection) [63]. Immunity meets industrial requirements of IEC 60947-4-2. Additionally, the starter is certified by **Lloyd's Register and ABS** for marine use, indicating it passed additional vibration, humidity, and salt spray tests [62]. It has the **CCC** certification for China and **RCM** mark for Australia/New Zealand, reflecting its global application [28]. Such approvals assure the user of the starter's safety and reliability under a variety of standards.

- **Warranty:** Benshaw backs the EMX4e with an **exclusive 3-year warranty** from date of purchase [64]. This demonstrates confidence in the product's durability and gives end users peace of mind when implementing the soft starters in critical operations.

Overall, these specifications highlight a well-rounded soft starter product that meets or exceeds industry norms for performance and safety. The EMX4e covers a wide range of motor sizes with a relatively small number of models, simplifying selection and spare stocking. Its electrical endurance and thermal capacity are suitable for the majority of standard motor starts, and it interfaces cleanly with power systems and control systems alike. Next, we consider some real-world examples of how such soft starters provide value in various applications.

Real-World Applications and Benefits

Soft starters like the Benshaw EMX4e are used across industries wherever induction motors drive loads that benefit from controlled starting. Below are a few scenarios illustrating the EMX4e in action and the tangible benefits it can provide:

- **Pumping Systems (Water & Wastewater):** Perhaps the most dramatic advantage of advanced soft starters is seen in pumping applications. As discussed, the EMX4e's adaptive control can **mitigate water hammer** by controlling pump speed profiles during start and stop [10] [14]. In a municipal water supply station, for example, replacing old DOL starters with soft starters eliminated frequent pressure surge events that had been rupturing pipes and stressing check valves. Operators noted that with the soft starters' gentle pump acceleration, the loud "hammer" noise and shaking in pipes were gone, and maintenance incidents related to pipeline leaks dropped significantly. One **Benshaw case study** describes how using pump control soft stop on large pumps prevented transient pressure spikes, protecting a network of pipelines that previously suffered repetitive damage [16] [17]. Additionally, the soft starters' **dry pump protection (underload trip)** saved pumps from running empty when intake wells ran low – a feature that avoided burn-out of several high-value pumps. The overall outcome in such cases is improved system longevity and reliability of water delivery. These improvements are achieved without the expense of VFDs; as long as variable flow control isn't needed, the soft starters provide a cost-effective solution to the hydraulic surge problem while also minimizing energy losses (99.5% efficiency during full-speed run vs. ~95% in a VFD) [20] [22].

- **HVAC and Building Services:** In large commercial buildings or industrial facilities, **fans, blowers, and compressors** often utilize soft starters to reduce mechanical and electrical stress. For instance, starting a 200 kW centrifugal chiller motor across-the-line can draw a huge current surge that momentarily drags down the facility voltage and creates heat in motor windings. With an EMX4e soft starter, the same chiller can be started with a controlled ramp, cutting the peak current by 50–60% (depending on the current limit set) and avoiding nuisance trips of over-current relays or genset flicker. The mechanical benefit is also notable: HVAC fans started softly will **minimize belt slip and tension shock**, extending belt and bearing life [4] [65]. Building maintenance teams have reported fewer belt replacements and less frequent motor overhauls when using soft starters versus direct starters, directly attributing it to the reduction in start/stop stress. Moreover, by lowering inrush currents, facilities can often **reduce their peak demand charges** from utilities. Many utilities charge extra for the highest 15-minute interval of demand; soft starters shave the peaks off starting events, which for large motors can contribute to a lower kVA demand reading [66] [9]. This translates into operational cost savings. In sum, for HVAC systems, soft starters improve reliability and reduce both maintenance and energy costs – a dual benefit that increases the ROI of the equipment.

- **Industrial Machinery (Manufacturing & Processing):** The EMX4e finds extensive use in machinery such as **conveyors, crushers, mills, mixers, and saws**. These loads often have high inertia or can be easily damaged by abrupt starts. For example, a rock crushing plant in Chile installed AuCom/Benshaw soft starters on their 200 HP jaw crushers; the controlled starts not only prevented the lights from flickering (a power quality improvement) but also **stopped the repeated breakage of drive couplings** that they experienced with across-the-line starts [32] [67]. The maintenance manager observed that the reduced mechanical shock preserved the crusher's drivetrain and the motors ran cooler with fewer incidents of tripped overloads. After years of operation, they lauded the reliability gains, stating the soft starters met and *"regularly exceeded [our] expectations of reliability"*, and they fully recommended this solution to others [32] [33]. In another case, a lumber mill equipped its large circular saws with soft starters to protect the saw gearboxes from shock. The EMX4e's **current limit starting** ensured the saws accelerated smoothly even when cutting blades were engaged in wood, thus avoiding belt squeal and sudden jerk that could crack expensive blades. Additionally, the **soft stopping** feature (voltage ramp down) on certain high-inertia fans and centrifuges has been used to avoid "backspin" or reverse torque when the load stops – by keeping the motor slightly energized to decelerate it, the soft starter can prevent the uncontrolled coast-down that might otherwise cause torsional oscillations or reverse rotations in connected equipment.

- **Energy and Power Quality Considerations:** While energy savings from a soft starter aren't of the same nature as a VFD (since a soft starter doesn't continuously modulate power), there are still indirect efficiency and power quality benefits. Starting an induction motor across the line can induce significant **voltage sags** in the electrical network, especially if the supply impedance is high (e.g. rural or weak grid, or on generator power) [9]. These sags can dim lights and even cause sensitive equipment to malfunction. A technical whitepaper on power quality demonstrated that using a soft starter can **reduce voltage dip severity by over 40%** compared to DOL start for a given motor, by limiting inrush current [9] [68]. This not only keeps the motor's bus voltage more stable but also improves the **power factor during startup** (since current is reined in). Some facilities have large motors that were restricted from starting during peak hours due to utility flicker limits; adding soft starters often allows compliance with utility standards for voltage flicker, enabling more operational flexibility (e.g. starting additional pumps in parallel without exceeding flicker limits) [69]. Additionally, a soft starter eliminates the need for older reduced-voltage starter methods like star-delta or autotransformers, which had transition current spikes and moving parts that required maintenance. With solid-state starters like the EMX4e, **maintenance is minimal** (no contacts changing state during the start, except the internal bypass which is built for the duty). There are no electrolytic capacitors as in some older designs, and the cooling is typically natural convection for smaller sizes. This means years of operation with near-zero maintenance on the starter itself – just periodic tightening of connections and verification of parameter settings. By extending motor life and **reducing mechanical wear**, soft starters contribute to overall energy and resource savings since equipment does not have to be replaced or overhauled as frequently [4] [65].

- **Comparative Industry Landscape:** It's informative to note that the EMX4e stands among a class of modern digital soft starters offered by major manufacturers globally. For example, ABB's PST(X) series soft starters, Schneider's Altistart range, Siemens SIRIUS 3RW40/44, Eaton's S811+, and Rockwell/Allen-Bradley SMC-3/50 are all peers in this space. Many of these offer advanced features such as adjustable start/stop profiles, motor protection, and network communications similar to the EMX4e [70]. What differentiates the **Benshaw EMX4e** is its **balance of functionality and cost**. Benshaw (in partnership with AuCom) has essentially taken the proven technology from their high-

end EMX4i and packaged the “essentials” into the EMX4e model at a lower price point [1]. You still get critical features like adaptive acceleration control, internal bypass, full motor protection, and expandability, but you aren’t paying for extras like DC injection braking or multi-motor setpoint memory which you might not need in many applications. This makes the EMX4e extremely attractive for OEMs and end-users who need reliable soft starting for standard duty motors but want to keep costs under control. For instance, an OEM of pump skids can choose EMX4e starters to include in their panels, knowing it covers all the necessary pump protection and soft stop functions, without the premium of an oversized feature set. The EMX4e’s compatibility with all the same communications and accessories as the EMX4i means an OEM can design one panel layout and optionally upgrade the soft starter model based on end-user requirements, all within the same footprint. In short, the EMX4e provides **high-end performance at a mid-range cost**, which is why it’s often the go-to soft starter when “cost outweighs the need for extra features,” as Benshaw’s catalog notes [1].

Conclusion

The Benshaw EMX4e soft starter is a comprehensive solution for controlled motor starting, combining robust technical capabilities with a practical, cost-optimized design. By gradually ramping voltage and current, it **solves common motor startup problems** – limiting inrush currents that cause electrical disturbances and eliminating mechanical shocks that lead to equipment wear. The EMX4e stands out by offering adaptive acceleration control and an array of motor protections in a compact unit, ensuring that motors not only start smoothly but are also safeguarded throughout operation. Its ease of use (intuitive interface, data logging, and network connectivity) means faster setup and troubleshooting, which can be a significant advantage in industrial settings where downtime is costly.

In applications ranging from pumps and fans to compressors and crushers, the EMX4e has demonstrated tangible benefits: **longer motor and machinery life, reduced maintenance, improved safety, and lower energy costs** associated with demand peaks and power factor penalties. It effectively bridges the gap between basic electro-mechanical starters and more expensive variable speed drives or high-end soft starters – delivering just the right mix of features needed for fixed-speed motor applications at an accessible price point. Moreover, backed by a 3-year warranty and Benshaw’s engineering support, the EMX4e provides confidence in long-term reliability.

For engineers and operators, implementing the EMX4e means fewer start-up headaches and more control over how their motors behave. Whether the goal is to stop water hammer in a pipeline, prevent a conveyor from lurching, or simply to avoid nuisance trip outages on a weak power system, this soft starter offers a proven, modern solution. In summary, the **Benshaw EMX4e** delivers smart motor control **made simple** – helping facilities achieve smooth, efficient operation and protecting critical assets with every start. It is a solid choice to **improve your motor control strategy**, solving start/stop challenges today while providing the scalability and integration readiness to meet the demands of tomorrow’s smart factories.

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