ChatGPT

Lovato ADX Softstarters: Comprehensive Technical Overview

Introduction

Electric motors draw a very high current when started direct-on-line, often 6–8 times the normal running current. This inrush current and the abrupt application of full torque can cause **electrical stress** (voltage dips, peak demand surges) and **mechanical stress** (wear on gears, belts, pump impellers, etc.) in industrial systems [1] [2]. Soft starters are motor controllers that mitigate these issues by gradually ramping up the voltage supply to the motor, resulting in a **smooth acceleration** and controlled deceleration of the load. The Lovato **ADX series softstarters** are an advanced line of solid-state motor starters designed to reduce startup stresses, extend equipment life, and improve the reliability of motor-driven systems. Lovato ADX softstarters cover a wide range of motor sizes – from small 3-phase motors of a few kilowatts to large industrial machines up to hundreds of kilowatts – all while providing modern features for protection, monitoring, and easy integration [3] [4].

Example of a Lovato ADX heavy-duty soft starter (large 3-phase unit for motors up to ~800 kW). These units use thyristor modules to control the voltage on all three phases during startup, with an LCD interface for configuration and monitoring.

By using an ADX soft starter, the motor's input voltage is initially reduced and then ramped up over a set time. This **voltage ramp** prevents the sudden jolt of full voltage startup, thereby limiting the inrush current and gradually increasing motor torque [5] [6]. As a result, mechanical components experience less shock and wear, electrical systems avoid extreme current peaks, and common problems like **water hammer** in pump systems are minimized through controlled starting and stopping [7]. In the sections below, we explore the Lovato ADX softstarter family in detail – its design, technical specifications, key features, and how these can be applied to solve real-world motor control challenges.

Design and Key Features of the ADX Series

Lovato's ADX series encompasses a range of soft starter models built to handle different motor sizes and application demands. The series includes the **ADXL line** (advanced soft starters with two-phase control and modern features) and larger **ADX models** (heavy-duty soft starters with three-phase control for high-horsepower motors). Despite differences in size and control method, all ADX softstarters share the same fundamental approach of providing a **reduced-voltage, solid-state start** with built-in protections and easy-to-use interfaces. Below we summarize the key features and design characteristics that define the ADX series:

- **Smooth Soft Start and Stop:** All ADX softstarters allow a configurable **voltage ramp-up** at startup and ramp-down at shutdown. Users can set the initial voltage and ramp time to tailor how gently the motor accelerates and decelerates [8] [9]. This soft starting greatly **reduces mechanical stress** on

drive components and connected machinery by eliminating abrupt jerks [1]. It also **limits the starting current** drawn from the supply, which avoids tripping feeders and can reduce peak demand charges from utilities [2]. The ramp-down or **soft stop** function is especially useful for stopping high-inertia loads (e.g. pumps) gradually, preventing phenomena like water hammer that occur when flow is halted too suddenly [7]. Users can choose between a coasting stop (free wheel) or a controlled deceleration, depending on the application needs [9].

- **Two-Phase vs. Three-Phase Control:** The ADX family uses two different control topologies. The mid-range **ADXL models control 2 of the 3 motor phases** using thyristors, while leaving the third phase at full voltage (this approach provides a cost-effective soft start, with the motor receiving a balanced reduced torque) [10] [11]. For more demanding applications, the heavy-duty **ADX models control all 3 phases**, which allows for maximum control over the motor's voltage and torque throughout start and stop [12]. Three-phase control yields very smooth acceleration and is required for certain advanced functions (like **dynamic braking** and specialized stop modes). Lovato's heavy ADX units indeed support a **dynamic braking** feature, injecting a braking torque to quickly stop the motor when needed [13] [14]. In practice, both two-phase and three-phase controlled soft starters achieve the goal of reduced-voltage starting; the two-phase designs are typically sufficient for standard duty motors, whereas three-phase control is preferred for **severe-duty cycles or larger motors** where precise torque control and braking are important [15] [16].

- **Integrated Bypass Contactor:** A hallmark of the Lovato ADX design is the inclusion of an **internal bypass relay/contact** on most models. During the initial ramp, the soft starter's thyristors control the voltage. Once the motor reaches full speed, the device will activate the bypass relay to shunt the thyristors and connect the motor directly to line power [17] [16]. This **bypass mode** eliminates the continuous voltage drop and heat dissipation in the thyristors after startup, improving efficiency and ensuring the soft starter does not contribute harmonics during steady-state operation [18] [19]. Lovato ADXL units have a built-in bypass rated for the device's full current, and the heavy ADX units include an internal bypass up to a certain size (≈245 A). For the largest models above 245 A, the design is *"predisposed for external bypass"* – meaning an external contactor is used as a bypass, due to the very high currents involved [17] [16]. In either case, once bypassed, the soft starter no longer handles load current, which significantly extends its life and avoids extra losses.

- **Torque Control and Kick Start:** In addition to simple voltage ramping, the ADX series implements **closed-loop torque control** algorithms. Rather than just dropping voltage linearly, the soft starter can manage the motor's torque output to ensure a **smooth acceleration without torque spikes** [20] [21]. This is particularly beneficial for applications like conveyors or compressors where a linear rise in torque prevents jerking. Lovato ADX softstarters also offer a **"Kick Start"** feature [22] [23] – a momentary boost of voltage/torque at the beginning of a start. Kick start is used for loads that may be initially stuck or have high static friction (for example, a pump that needs a brief jolt to break away sediment). The soft starter applies a short burst of higher torque and then resumes the normal ramp, ensuring the motor can overcome static inertia before continuing a gentle acceleration.

- **Comprehensive Motor Protection:** Beyond controlling start/stop, Lovato ADX softstarters act as intelligent motor protectors. They continuously monitor current, voltage, and temperature and will trip or alarm on unsafe conditions. Built-in **electronic overload protection** can mimic motor thermal curves and is adjustable to match the motor's service factor. Notably, the ADXL allows separate overload class settings for the start phase and running phase [24] – meaning you can

tolerate a higher short-term current during startup without tripping, while still protecting the motor in steady state. The units also guard against **locked rotor/stalled start (no acceleration)**, **excessive start time**, and **insufficient torque** (which could indicate a load problem) [25] [26]. Standard protective functions include phase-loss and phase-sequence detection (to prevent damage if supply phases are lost or reversed) and under-voltage/over-frequency alarms [27]. The internal power stage is protected as well – the ADX monitors its own thyristor temperature and will shut down if overheating (with cooling fans on larger units), and it checks for SCR firing faults or bypass relay failures [28]. Additionally, a **PTC thermal sensor input** is provided so that a temperature sensor in the motor windings can be wired in; if the motor's internal temperature rises too high, the soft starter can trip to prevent burnout [29] [30]. This array of protections helps ensure safe operation and can **prevent motor damage or downtime** by reacting to abnormal conditions early.

- **Backlit Multi-Language Display and Controls:** A user-friendly **LCD interface** is integral to the ADX series. The smaller ADXL models feature a backlit icon/text LCD that supports six languages (English, Italian, French, Spanish, Portuguese, German) for on-screen menus [31] [32]. The larger ADX units also have an LCD display (with up to four languages supported on those models) [33] [34]. Through this interface and the keypad, users can program parameters, start or stop the motor, and view real-time measurements. The **displayed measurements** include phase currents (L1, L2, L3), the percentage of nominal torque being delivered, average line voltage, power factor, and total active power consumed by the motor [35]. For maintenance purposes, the ADX softstarter also keeps counters such as the number of start cycles performed and the motor run hours [36] [37]. Maintenance alarms can be configured based on these counts – for example, to alert when a certain number of starts has been exceeded, indicating the motor or starter may require inspection [36] [38]. This kind of **integrated monitoring** helps with **predictive maintenance**, letting operators service equipment at optimal intervals rather than reacting to failures. The display and menu system make the setup straightforward as well; Lovato provides an **installation wizard** for initial configuration, meaning even complex parameters can be set correctly in just a few guided steps.

- **Modern Configuration and Communication Tools:** The ADX series embraces modern connectivity to simplify setup and integration. Notably, the **ADXL soft starters have NFC (Near Field Communication)** capability built-in [39]. By using a smartphone or tablet with Lovato's app, users can simply tap the device to the soft starter to read or write configuration settings. This allows for quick programming **without powering the unit** (NFC can work from the device's stored power) and the ability to copy configurations to multiple starters easily. In addition, ADX starters come with an **optical port** on the front panel [40]. Using a special optical/USB adapter and PC software, one can connect to the soft starter for full parameter programming, firmware updates, data download, and diagnostics on a laptop. For networked systems, **communication modules** are available: the ADXL series accepts an optional plug-in **RS-485 serial module** (Lovato EXC1042) to enable Modbus communication [41] [42]. With the RS-485 module, the soft starter can communicate using **Modbus-RTU or Modbus-ASCII protocols** to integrate into PLCs, SCADA systems or other automation networks [43]. (Lovato even offers a Modbus-TCP/IP interface option via an external gateway for certain models [44].) The heavy-duty ADX models come with **integrated RS-485** and Modbus-RTU support out of the box [45] [46]. This connectivity enables remote control and monitoring – for example, linking the starters to Lovato's **Synergy** supervision software or to a plant DCS. In an Industry 4.0 context, such communication features are increasingly important; they allow the soft starter to provide data for **condition monitoring** and to be controlled or diagnosed remotely as part of a smart factory system [47] [48].

- **Robust Construction:** Lovato ADX softstarters are built for industrial environments. They are **open-style units (IP00)**, intended to be mounted in an electrical cabinet or enclosure [29]. The power circuits use heavy-duty SCR (thyristor) pairs per phase, mounted on heatsinks with fan cooling for larger sizes. The devices are rated for **continuous operation in high ambient temperatures**, with appropriate current derating if necessary (typical operation is specified at 40 °C ambient without derating, and they can be used in higher temperatures with reduced current). The design meets international standards **IEC/EN 60947-4-2** (the standard for low-voltage semiconductor motor controllers) and **IEC/EN 60947-1**, as well as UL 508 and CSA C22.2 No.14 certifications for use in North America [49] [50]. In terms of electrical ratings, the ADX series can handle **severe duty starts** – the heavy models are specified for up to **500% (5×) motor full-load current for heavy starting** conditions [51] [52]. They also carry a **pollution degree 3** rating, suitable for typical industrial facility environments [13]. The control electronics of the ADX starters are powered by a separate **auxiliary supply** (100–240 VAC is the standard control voltage range on ADXL models, and 208–240 VAC on the largest ADX models) [53] [54]. This ensures consistent control logic power regardless of the main motor voltage. Many models in the series are UL-listed variants (denoted by a "UL" suffix in the part number), which come with required terminal covers or lug kits for UL compliance [55]. Overall, the build quality and compliance of the ADX softstarters make them reliable components suitable for global applications.

Front view of a Lovato ADXL series soft starter (small-frame unit). The built-in LCD screen and keypad allow easy parameter setting and show status icons (such as torque percentage and NFC connectivity). The compact ADXL models can mount on panels or DIN-rails and include internal bypass contactors.

Technical Specifications and Range

The Lovato ADX family is designed to accommodate a broad spectrum of motor sizes and performance requirements. Key technical specifications for the series are summarized below:

- **Motor Power and Current Ratings:** The ADXL (two-phase control) models cover motors roughly from **7.5 kW up to 160 kW** (at 400 VAC supply) [56] [57]. In terms of current, this corresponds to an IEC rated starter current range of **18 A up to 320 A** in the ADXL series [58] [59]. Specific model sizes are available at intermediate steps (common sizes include 30 A, 45 A, 60 A, 85 A, 115 A, 135 A, 162 A, 195 A, 250 A, and 320 A, among others [60] [61]). On the other hand, the heavy-duty ADX (three-phase control) series starts at around **17 A** and goes up to **1200 A** max rating for the largest unit [3] [4]. That corresponds to motors as large as **630–710 kW** (approximately 800–950 HP) on a 400–480 V system for the top-end model [4]. This extremely wide range (covering fractional 10 HP motors through 800+ HP) means a single product family can be used across a facility for various motor sizes, ensuring consistency in user interface and maintenance. It's worth noting that very high-power soft starters (above about 300 A) will typically require careful engineering (e.g. using external bypass and adequate cooling space, as provided in Lovato's 51ADX1200 unit for 1200 A/800 kW [13]).

- **Operational Voltage and Frequency:** All ADX softstarters are intended for standard three-phase AC induction motors. The **rated operational line voltage** ranges from **208 VAC up to 600 VAC** for ADXL models [53], making them suitable for 208 V, 240 V, 480 V, or 600 V supply systems (common in North America) and 380–415 V systems (common in Europe/Asia) within that window. The heavy ADX series in standard form covers up to 500 VAC; Lovato also provides specific high-voltage versions up to 690 VAC for the ADXT models (an extension of the ADX line) for use in 660–690 V networks [62] [63].

Frequency is **50/60 Hz self-configuring**, meaning the soft starter automatically adapts to either 50 Hz or 60 Hz systems without user adjustment [64]. The control electronics (auxiliary supply) accept **100–240 VAC** (50/60 Hz) on ADXL and **110–120 VAC / 220–240 VAC** dual-range on ADX heavy models [65]. This flexibility in control power allows the starter to be powered from a local control circuit or one phase of the main supply as needed.

- **Starts per Hour and Duty Capability:** Soft starters inherently generate heat in their power devices during each motor start. The ADX series is designed for both **standard duty and heavy duty starting**. For standard applications (normal loads with modest start frequency), these starters can often perform **several starts per hour** (exact values depend on the model and motor load – for instance, smaller ADXL units might allow around 10 starts/hour at full load, whereas larger ones might allow 4–6 starts/hour). Lovato documentation provides specific tables for maximum starts per hour considering various ramp times and inertia levels [66]. The heavy ADX units are explicitly rated for **severe duty starts** with up to **5× nominal current for a limited time** [51]. This means they can handle high inertia loads or applications like crushers or conveyors that need a strong torque push to get moving. After a heavy start, the device may require a longer cool-down before the next start. It is important for users to **consult the duty cycle curves** in the manual and ensure the selected soft starter model can support the required start frequency of their application without overheating. All ADX softstarters include temperature sensors on the SCR heatsinks and will issue an alarm or block further starts if the device surpasses its thermal limits, thereby preventing damage [28].

- **Efficiency and Power Loss:** During startup, the soft starter's SCRs conduct partial voltage and will dissipate power (voltage drop times current). However, once at full speed, the **integrated bypass relay closes** to eliminate the SCR losses. Therefore, in steady state, the soft starter introduces negligible additional power loss – the motor sees the full line voltage with essentially no drop across the bypass contact. This is an important advantage: unlike a variable frequency drive (VFD) which always has some power electronics in-line, a bypassed soft starter is as efficient as a direct connection and **adds no harmonic distortion** during normal run [18]. The ADX series thus achieves energy efficiency in operation; energy is only dissipated during the brief acceleration/deceleration periods. Additionally, when comparing to older reduced-voltage methods (like autotransformer or star-delta starters), the solid-state ADX can often optimize energy use by reducing current more effectively and avoiding overshoot or transients. While soft starters themselves do not provide running energy savings (the motor still runs across the line at full speed), the **avoidance of peak current** can indirectly save costs by lowering peak demand charges and preventing voltage sags that might affect other equipment [2].

- **Standards Compliance:** Lovato ADX softstarters are designed in compliance with international standards for motor control and safety. They meet **IEC/EN 60947-4-2** (Low-voltage semiconductor motor controllers and starters) and **IEC/EN 60947-1** (general rules for low-voltage switchgear) [49]. For use in North America, they carry **UL 508** certification and **CSA C22.2 No. 14** (industrial control equipment) approval [49]. This means the devices have been tested for electrical safety, fire hazard, and performance requirements, allowing them to be used in UL-listed industrial panels or installations. The ADX units also adhere to the CE marking requirements for sale in the EU, including EMC directives (they have built-in RFI filters or require external line filters as per manual recommendations to meet emissions standards). In practical terms, compliance to these standards ensures that ADX softstarters can be confidently specified in projects worldwide and will interface

properly with other certified equipment (for example, using recommended circuit breakers or fuses in accordance with IEC coordination tables).

Applications and Use Cases

Soft starters like the Lovato ADX series are employed across industries wherever three-phase induction motors are used, especially in applications that benefit from smoother starting or stopping. Some **common use cases** include:

- **Pumping Systems:** Pumps for water, wastewater, irrigation, and industrial fluids greatly benefit from soft starters. A soft starter reduces the hydraulic shock in piping by gradually accelerating the pump and can implement a soft stop to mitigate **water hammer** when stopping [7]. Lovato's torque control soft stop is ideal for large pumps in municipal water stations or building services – it prevents pressure surges that could burst pipes or damage check valves. Moreover, by avoiding pressure spikes and sudden reversals, **maintenance on pump seals and bearings is reduced**. In one real-world case, a water treatment plant experienced frequent pump failures due to high startup stress; after installing soft starters on the pumps, the plant significantly **reduced maintenance costs and extended the pump life**, with the investment paying for itself within the first year due to less downtime [6][7]. The ADX softstarters also have a low-current start mode which can be crucial for **weak power networks or generator-supplied pumps**, preventing generator overload by limiting the inrush. (For example, agricultural irrigation pumps running on generator power often require soft starters to avoid stalling the generator on startup.)

- **Fans and HVAC Blowers:** Large fan motors in HVAC systems or industrial ventilation see mechanical stress on belts and dampers when slammed to full speed. Using a soft starter eliminates the initial jerk, **protecting belt drives and extending belt life**. It also avoids high inrush currents that can cause voltage flicker in facilities. The ADX softstarter's programmable **initial torque** means even fans with significant static inertia can be reliably started at a reduced current. For axial fans and cooling towers, a soft stop can prevent the sudden airflow reversal or "windmilling" effect when power is cut. Soft starters are often favored over VFDs for fans when only line starting/stopping is needed (since they are more cost-effective and introduce no harmonics once running).

- **Conveyors and Material Handling:** Conveyor belts carrying product (e.g. in manufacturing lines, baggage handling, mining conveyors) need controlled starting to avoid belt slip or product toppling. A direct-on-line start might make a conveyor jerk forward, possibly spilling or misaligning the material being conveyed. The ADX series' **smooth ramp and adjustable acceleration** allow conveyors to begin motion gradually, protecting not only the motor but also the gearbox, chain drives, and the conveyed goods. Additionally, soft starters on multiple conveyor sections can be coordinated to start sequentially, preventing an excessive simultaneous load on the power system. With built-in **motor overload protection and stall detection**, the ADX softstarter can also shut off the conveyor motor if a jam occurs (stall torque), preventing burnout and alerting operators to the condition.

- **Compressors and Refrigeration:** Compressors (air compressors, refrigeration compressors) often start under load and have a high starting torque requirement. Using an ADX soft starter with the **kick start** feature can help break initial static friction in a compressor, then smoothly ramp up compression. This alleviates mechanical stress on couplings and compressor bearings. It also helps

manage the electrical load — large compressors can cause significant voltage dip on startup, which a soft starter will reduce by limiting the current. Note that for some compressor types (e.g. screw compressors), soft starters are a preferred solution when full speed operation is needed and speed control (VFD) is not necessary.

- **Mixers, Agitators, and Mills:** Mixers in food processing or chemical plants, and milling machines or crushers, tend to have high inertia and can draw huge currents if started across the line. Soft starters provide a **gradual increase in torque** that protects gearboxes and mixing blades. They also can prevent ingredients from sloshing or spilling due to sudden starts in mixing tanks. In the case of mills or crushers, a soft starter reduces shock loading on the drive shafts and can be paired with **current limit settings** to ensure the motor never exceeds a set torque (useful if a jam or overload happens – the soft starter will trip rather than the motor stalling indefinitely).

- **General Industrial Machinery:** Many other machines, from **centrifuges to saws and grinders**, can use soft starters. Any equipment where **smooth acceleration** would reduce mechanical wear or where the electrical system cannot easily handle large DOL starting currents is a candidate. Soft starters are often part of energy-saving and **power quality improvement strategies** in factories: by avoiding frequent high current surges, facilities can stay below utility peak demand thresholds and reduce the risk of nuisance trips on protection devices. The Lovato ADX's ability to integrate with supervisory software (via Modbus or Synergy) means it can also be used as part of a plant's energy management system, reporting the motor's energy usage and start data. Many modern soft starters, including Lovato's, support specialized modes like **pump cleaning (anti-clogging)** or **auto-parameter tuning** on certain models [68] [69]. (For instance, advanced soft starters by some manufacturers can perform a brief reverse spin of a pump to clean impellers, or adjust ramp profiles automatically based on load feedback. Lovato's ADX focuses on core soft start/stop and protection functions, while being compatible with external control schemes to achieve similar outcomes.)

It's also worth mentioning that **soft starters vs. drives** is a common consideration. While variable frequency drives (VFDs) offer full speed control and even greater reduction of start current, they are more expensive and not always necessary if the motor will run at full speed continuously. Soft starters like the ADX are an excellent *simpler* solution when the goal is only to mitigate start/stop issues rather than vary speed. They have a smaller footprint, simpler setup, and, as noted, **no continuous power loss or harmonics once bypassed**. Many facilities use a combination of VFDs (for variable-speed needs) and soft starters (for fixed-speed but high-power motors) to balance cost and performance. Lovato ADX units provide much of the intelligent protection and connectivity found in modern drives (such as diagnostics, communications, and pre-programmed ramp profiles) without the complexity of speed control. In summary, the ADX softstarters are widely applicable across industries – from **water treatment plants to manufacturing, oil & gas, mining, building services, and more** – serving to protect motors and mechanical systems while simplifying the electrical design of motor control centers.

Implementation Tips and Best Practices

To get the most out of a Lovato ADX soft starter, installers and engineers should keep a few best practices in mind:

- **Proper Sizing:** Always size the soft starter according to the motor's rated current and the application's starting requirements. Ensure the unit's rated current (Ie) is **equal or above the**

motor's full-load current. For heavy-duty starts (high inertia or frequent start/stop), it can be wise to choose one size up to provide thermal margin. Lovato's selection charts (which consider motor kW, supply voltage, and load type) should be followed. Avoid under-sizing (which can lead to overheating) and extreme over-sizing (which is uneconomical and might reduce measurement accuracy) [70] . Also consider the **service factor** – if the motor is to be operated near its limit or in hot ambient, a larger starter may be necessary. The ADX softstarters have parameter settings for different motor service classes; use these to match the motor and avoid nuisance trips.

- **Installation and Cooling:** Since ADX starters are IP00 open devices, they must be mounted inside an appropriate electrical enclosure to protect them from dust, moisture, or accidental contact. Follow clearance guidelines around the unit for cooling airflow. The larger ADX units come with **forced-fan cooling**, which means they will circulate air – ensure that the enclosure has ventilation or cooling as needed to dissipate heat from both the motor starting and the soft starter's own losses. Lovato typically specifies a maximum enclosure temperature – make sure this is not exceeded in your panel design. Mount the soft starter in a vertical orientation (as recommended by the manufacturer) and use the supplied terminal covers or finger guards for safety, especially for UL compliance. Additionally, check if **input line reactors or transient voltage surge suppressors** are recommended. In areas with frequent voltage spikes or when driving motors with long feeder cables, using transient protection can prolong SCR life.

- **Bypass Contactor Usage:** For very large motors using the heavy ADX units above 245 A, you will need to install an external bypass contactor (as indicated in Lovato's documentation) [17] [71] . The soft starter will control the timing of this contactor (usually via an auxiliary output that energizes when ramp is complete). Ensure the bypass contactor is sized for the motor current and is electrically interlocked such that it only closes when the soft starter signals and opens when the soft starter is reset or starting a new cycle. Using a bypass contactor for the largest soft starters is crucial to prevent overheating the SCRs in continuous run – without bypass, those units are only meant for short-time duty. When an external bypass is used, coordination of protections is important: the soft starter's overload should typically be configured or an external relay used to trip the contactor in case of motor overload, since once bypassed, the soft starter can no longer electronically limit current.

- **Parameter Setup:** Take advantage of the **commissioning wizard** provided in the ADXL series. This guided setup will prompt you for basic motor data (voltage, current, motor type) and desired start/stop behavior, then auto-set many parameters to appropriate values. After that, fine-tune settings as needed: e.g., set the **ramp time** suitable for the load (a pump might need a longer 10–15 second ramp to avoid water hammer, while a fan might use a shorter 5 second ramp). Adjust the **initial voltage** – too low and the motor may not overcome static friction (causing a prolonged start or stall), too high and you negate some soft start benefit. A common approach is to start at around 30–40% initial voltage and ramp up; if the motor struggles to start, increment the initial voltage or engage Kick Start for 0.5 s. If the installation has sensitive supply conditions, consider using the **current limit** function: ADX starters allow you to set a maximum start current (e.g. 300% of FLA) [22] [23] , and the starter will automatically adjust the voltage to not exceed that current. This can be very useful to ensure generator-backed systems or weak grids are not overtaxed. Observe the first few start operations and check the **monitoring readouts** (peak current, start time, etc.) on the LCD – these can inform if further tuning is needed. Also configure the **motor overload class** and **thermal**

protections to match the motor and application duty – e.g., choose class 10, 20 or 30 per IEC curves depending on how long the motor can safely endure startup surges.

- **Utilize Alarms and Diagnostics:** The ADX softstarter's event log and diagnostic features are valuable for ongoing maintenance. Periodically check the **event log** (accessible via the menu or PC software) to see if there have been any alarms or trips – such as over-temperature warnings, phase faults, or starts exceeded. Investigate and resolve any repeated warnings. Set the **preventive maintenance alarms** for startup count and runtime hours based on your maintenance schedule. For example, if the motor's bearings are typically greased every 1000 starts, set an alarm at 1000 to prompt inspection. The ADX's data (like highest recorded current or motor thermal state) can help troubleshoot issues – for instance, a high number of starts per hour alarm might indicate an undersized motor or a process issue causing frequent stopping. By integrating the soft starter's **Modbus communication** to a central system, you can have these alarms annunciate on your SCADA/HMI, enabling operators to take action swiftly. Remember that soft starters also should be tested periodically: simulate a power outage to ensure the starter recovers safely, and verify the bypass contactor operation if external. Keep firmware up to date if Lovato provides updates (the optical port can upload new firmware, which may enhance functions or fix bugs over time).

- **Complementary Devices:** Soft starters are often one component in a larger motor control scheme. It's wise to coordinate them with other devices: use the soft starter's **programmable relay outputs** to signal status to PLCs (e.g. one output can indicate "Motor Running at Full Speed (Bypass Active)", another can indicate "Fault Condition"). Wire the **top-of-ramp signal** to any interlocks needed (for instance, to only allow a pump discharge valve to open once the motor is at full speed). In applications like pumps, consider pairing the ADX with a **phase reversal monitor or power factor relay** as an extra safety to detect if the pump is running unloaded or reverse (though the ADX itself can detect low torque conditions). For **safety considerations**, if an emergency stop is required, it will typically drop power to the soft starter or use a contactor upstream to disconnect – ensure your control circuit is designed so that the soft starter will shut down immediately during an E-stop (and note, a standard soft starter does not provide the "Safe Torque Off" (STO) functionality by itself; if SIL-rated stopping is needed, an external safety relay and contactor should be used to remove power as per safety standards [72] [73]).

Following these practices will help ensure a successful installation that leverages all the advantages of the Lovato ADX softstarters. When configured and used properly, the ADX series can dramatically **improve system reliability** by reducing mechanical wear and electrical stress, while also providing valuable monitoring data for operations and maintenance.

Conclusion

Lovato's ADX softstarter series offers a **powerful yet user-friendly solution** for controlling 3-phase motor startups and stops. By smoothly ramping voltage and limiting current, ADX softstarters protect both the electrical supply and the mechanical drivetrain from the harmful effects of sudden motor starting. The series spans from compact units handling small motors of a few kilowatts, up to heavy-duty starters for hundreds of kilowatts, all sharing a consistent interface and feature set. With innovations like NFC smartphone programming, integrated bypass contactors, and comprehensive motor protections, the ADX series exemplifies the modern generation of reduced-voltage starters that are **smarter and more capable than traditional techniques**. These softstarters incorporate many benefits previously found only in VFD

systems – such as torque control, digital diagnostics, and network communications – while keeping the system design simple for fixed-speed applications.

In industrial practice, installing ADX softstarters can lead to longer equipment lifetime, higher process uptime, and even energy cost savings (through lower peak demands and targeted maintenance). From water pumps and fans to conveyors and compressors, the ADX series has proven effective in **solving startup challenges** and ensuring smooth operations. Because they adhere to international standards and offer flexible configuration, these soft starters can be confidently integrated into new projects or retrofitted into existing motor control centers worldwide. In summary, the Lovato ADX softstarters stand out as a **reliable, high-performance choice** to optimize motor control – helping customers **solve problems** like equipment stress, downtime, and power quality issues in a broad range of applications. By combining deep technical capabilities with ease of use, the ADX series is positioned as a go-to solution for modern motor starting needs, delivering both protection and performance where it matters most.

References

1. Lovato Electric – *"Soft Starters – ADX". (Lovato Electric official product overview)* – Describes the ADXL and ADX series soft starter ranges, including controlled phases, current ratings (30–320 A for ADXL, 17–1200 A for ADX), motor kW ranges, integrated bypass design, and communication features. Link
2. Lovato Electric – *Product Catalog Excerpt (Capitolo 5). (Technical PDF via TME)* – Detailed technical data for Lovato soft starters (ADXC, ADXL, ADX), including feature comparison table and standards compliance (IEC 60947-4-2, UL 508, etc.).
3. Aim Dynamics – *"ADXL Soft Starter by Lovato"* (Product Description) – Provides a thorough feature list of the ADXL series (two-phase control soft starters with LCD, NFC, range 18–320 A) and lists all integrated protections and functions (torque control, kick start, programmable I/O, etc.). Link
4. RS Components – *Lovato 51ADX1200 Soft Starter (800 kW)* – Example of a high-end ADX series soft starter, 1200 A unit, confirming three-phase control, external bypass, forced cooling, LCD interface, and dynamic braking for large motors. Link
5. Mitchell Lewis & Staver – *"Soft Start Controls"* – Explains the benefits of reduced-voltage soft starters for pump systems, highlighting reduced mechanical stress, lower peak demand charges, and adjustable torque. Lists advantages of soft starters in pump and irrigation applications. Link
6. Xichi Electric – *"Solid State Soft Starters for Pumping Applications – Improve Efficiency & Reduce Wear"* – Blog article (2024) discussing how soft starters reduce inrush current and mechanical wear in pump systems. Includes a case study of a water treatment plant where soft starters cut maintenance costs and improved pump life (payback in one year). Link
7. Electrical India Magazine – *"Soft Starter Technology in the Age of Industry 4.0"* – Industry article describing advanced soft starter features (pump stop to avoid water hammer, pump cleaning, auto-parameterization, condition monitoring). Mentions modern soft starters like Siemens 3RW5 series with such features, providing context for the state-of-the-art in soft start technology. Link
8. ABB Technical Journal – *"Motor starting with Soft starters – Reduced stresses"* (2014) – Technical note on soft starter benefits: outlines how thyristor-based soft start reduces mechanical/electrical stress and dispels misconceptions about harmonics when using bypass. Useful for understanding the general principles applied in products like ADX. Link

---

1 6 7 67 70 Solid State Soft Starters for Pumping Applications | Improve Efficienc -XICHI
https://www.xichielectric.com/news/solid-state-soft-starters-for-pumping-applications-improve-efficiency-reduce-wear/

2 Soft Start Controls - Mitchell Lewis & Staver
https://www.mitchellewis.com/product/soft-start-controls/

3 4 10 11 12 15 16 17 41 42 44 45 46 58 59 Soft Starters
https://em.lovatoelectric.com/synergy/energy-monitoring/adx-soft-starters/?lang=en

5 20 21 47 48 68 69 72 73 SOFT STARTER TECHNOLOGY IN THE AGE OF INDUSTRY 4.0 | Electrical India Magazine
https://www.electricalindia.in/soft-starter-technology-in-the-age-of-industry-4-0/

8 9 22 23 24 25 26 27 28 29 30 31 32 35 36 37 38 39 40 43 53 55 56 57 60 61 64 66 Aim Dynamics | ADXL Soft Starter by Lovato
https://aimdynamics.com/adxl-soft-starter-by-lovato

13 14 51ADX1200 | Lovato ADX Soft Starter, 800 kW, 415 V ac, 3 Phase | RS
https://twen.rs-online.com/web/p/motor-starters/2740571?srsltid=AfmBOop24exXcR3KS3wx-tZd32txoGr1kcC3ChnOqV4ENLAbHN-mStgv

18 19 library.e.abb.com
https://library.e.abb.com/public/151fdb9b43c49ee648257cc4003bc11b/Motor+starting+with+soft+starters+-+Reduced+stresses.pdf?x-sign=2GH8Ae77ldoVsNAlqQUJkay9LKWmQOgGnTNp4OyWNrVFCt1rfcmgrcWBqQ6Aj82D

33 34 49 50 51 52 Capitolo 5
https://www.tme.com/Document/c9a1ebf5bb8bcac543c224c83de38507/LOVATO-05-EN.pdf

54 51ADX1200 | Soft starters - LOVATO Electric spa
https://catalogue.lovatoelectric.com/gl_en/51ADX1200/snp

62 63 65 Soft starters
https://catalogue.lovatoelectric.com/gl_en/Products/Soft-starters/CAP05/pc

71 [PDF] Soft starter with torque control ADX - SklepFalowniki.pl
https://www.sklepfalowniki.pl/?p=download-file&sFile=Instrukcja_obslugi_Lovato_51ADX_ENG.pdf