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Lenze AC Tech SCM Series Variable Frequency Drives (VFDs)

Lenze-AC Tech's SCM series is a line of sub-micro AC drive inverters known for their compact size and robust capabilities. These VFDs are designed to provide reliable **variable speed control, soft starting, and reversing** for small to mid-sized AC motors, all in a cost-effective package [1] [2]. The SCM series covers a broad **power range of 0.33 HP up to 15 HP** (0.25–11 kW) and supports supply voltages from **120 V single-phase up to 480 V three-phase** input, making them suitable for a wide variety of applications and power systems [3] [4]. In short, the Lenze SCM drives offer an economical yet feature-rich solution for OEMs and end-users seeking simple and effective motor control.

A Lenze-AC Tech SCM series VFD unit. The SCM drives are compact and designed for panel mounting (IP20 enclosure). They feature a basic built-in keypad and 3-digit LED display for programming and monitoring, along with easily accessible terminals for line input (L1, L2/N, L3), DC bus connections (B+, B− for dynamic brake), and motor output. This sub-micro drive exemplifies the flexible, simple, and robust design of the SCM series.

Power Range and Technical Specifications

The **Lenze SCM VFDs** span a wide performance range to accommodate different motor sizes and power sources. Key technical specifications include:

- **Output Power:** Models support motors from **1/3 HP to 15 HP** (approximately 0.25 to 11 kW) [3]. This covers many small pump, fan, conveyor, and machine drive requirements in one unified product series.

- **Input Supply Options:** Available for **120 VAC single-phase**, **208–240 VAC single-phase or three-phase**, and **400–480 VAC three-phase** input lines [5]. (For example, a 2 HP model can accept 208–240 V single-phase input and provide 3-phase output to the motor [6].) All variants output a three-phase PWM waveform to the motor at the appropriate voltage.
- **Output Frequency Range:** Capable of **0 Hz up to 240 Hz** output, allowing motors to run at very low speeds or up to ~4× their base speed if the application requires [7] [8]. The drive's base frequency is configurable (typically 50 Hz or 60 Hz by region), and the maximum frequency can be adjusted up to 240 Hz.
- **Control Method:** Uses a **volts-per-hertz (V/f) control scheme** (open-loop scalar control). This simple control method ensures compatibility with standard AC induction motors without feedback. The SCM is optimized for general-purpose speed control and soft starting; for applications needing high low-speed torque or sensorless vector control, Lenze offers other series (e.g. the SMV or TCF series) [9] [10].
- **Overload Capacity:** Provides **current limiting up to 180% of rated current** with automatic foldback [11]. In practice, this means the drive can handle short-term overloads or heavy startup torque – it will allow ~180% current briefly and then reduce output to protect itself and the motor. A built-in UL-approved electronic thermal overload function protects the motor from overheating [12], eliminating the need for separate motor overload relays in most cases.
- **Enclosure and Size:** All SCM drives come in a compact **IP20 enclosure** (NEMA 1 vented style) for mounting inside a control panel [13]. The design is very space-efficient ("sub-micro" footprint). For example, smaller units are only around 5–6 inches tall, which helps when retrofitting into tight spaces. **Fan cooling** is utilized on higher-horsepower models, while smaller units rely on convection cooling through their finned aluminum heatsink. Operating ambient temperature is typically 0–40 °C (with possible derating above 40 °C). Standard models are designed for installation up to about 1000 m altitude without derating, per typical VFD practice.
- **Protection Features:** The SCM drives include comprehensive protection and diagnostic features. They monitor for conditions like overcurrent faults, high/low line voltage, drive over-temperature, motor overload (thermal), and more [14] [15]. The drive's **fault history log stores the last 8 fault codes** for troubleshooting purposes [16]. Integrated **DC bus transient protection** and voltage surge suppressors help the drive handle line disturbances. Note that **input fusing or a circuit breaker** is still required per installation guidelines, and adding an input line reactor or EMI filter is recommended especially on higher voltages to reduce harmonics and interference.

Overall, the Lenze SCM series provides a solid set of specifications that cover the essentials for most light industrial and commercial motor control tasks. From a single product family, one can find a suitable model whether the goal is running a small 120 V fan motor or a larger 15 HP three-phase pump.

Control Features and Functionality

Despite being a cost-conscious "basic" drive, the SCM series is **feature-rich in terms of control capabilities**. It virtually eliminates the need for external motor control components like multi-speed contactors or separate phase converters, because the drive itself can handle those functions electronically [17]. Notable control features include:

- **Multiple Operating Modes:** The drive supports **simple two-wire start/stop control** (maintained run contact) as well as **three-wire control** (start/stop pushbuttons) for integration into various control schemes [18] [19]. A dedicated terminal for **RUN/STOP** (TB-1) is used in two-wire mode, or can

serve as a STOP input in three-wire mode with separate Start-Fwd/Start-Rev inputs [20] [21]. This flexibility makes it easy to tie the VFD into existing motor starter circuits or PLC control outputs.

- **Programmable Digital Inputs:** In addition to the Run/Stop circuit, the SCM provides **3 programmable digital input terminals** (typically labeled TB-13A, 13B, 13E) that the user can assign to a variety of functions [22] [23]. Common assignments include forward/reverse selection, preset speed select, jog, external fault interlock, and increase/decrease speed (floating master oscillator mode) among others [24] [25]. This allows complex control logic (like multi-speed or jogging sequences) to be implemented with just simple dry contacts or PLC outputs. For example, with three digital inputs, the drive can store **up to 7 or 8 preset speeds** and select them based on different input combinations [26] [12]. This is very handy for applications like material handling systems that might need a few fixed speed points.
- **Analog Speed Reference:** Every SCM drive includes an analog input that can be used for speed control. It accepts either a **0–10 V DC signal or a 4–20 mA current signal**, selectable via parameter [27]. A built-in 10 V supply (TB-6) is provided to wire a potentiometer for a local speed knob if desired [28]. This analog input makes it straightforward to interface the drive with external sensors, PLC analog outputs, or manual speed potentiometers to control motor speed in a continuous manner.
- **Output Contacts and Signals:** The drive includes one **Form A relay output (isolated)** and one configurable open-collector transistor output [29]. The relay (at terminals TB-16 and TB-17) can be programmed for functions such as running, fault indication, or at-speed indication (rated 3 A at 250 VAC) [29]. The open-collector output is available by re-purposing one of the input terminals (TB-13E) as an output if needed [30] – for example to drive an external relay or a brake solenoid, with up to 50 mA at 15 V DC supply. These outputs give the user feedback and the ability to actuate external devices based on drive status (for instance, turning on a cooling fan whenever the VFD is running, or triggering an alarm light if the drive trips on a fault).
- **Acceleration, Deceleration and Braking Control:** The SCM allows the acceleration and deceleration ramp times to be configured (e.g. 0.1 to 3600 seconds) to achieve **soft-start and soft-stop** as needed [31] [32]. Gentle ramping prevents mechanical shocks to machinery and high inrush currents. In addition, the drive can perform **DC injection braking** – upon stopping, it can inject DC current into the motor to rapidly bring it to a halt and hold it, which is useful for quick stops or preventing coasting [33]. The duration and level of DC braking are adjustable. For even faster stopping from high speeds or for handling overhauling loads, the **dynamic braking option** can be used (described later).
- **Critical Frequency Avoidance:** A feature often needed in fan/pump systems is skip frequency bands to avoid mechanical resonances. The SCM drives support programming a **"skip frequency" band** – a narrow range around a frequency that the drive will avoid dwelling at, to prevent vibration issues. This is part of the advanced parameter set (skip band center and bandwidth).
- **Current Limit and Stall Prevention:** As noted, the drive will limit its output if motor current exceeds the set threshold (default ~180% of drive rating) [11]. This **current limit** acts as an electronic torque limit – the drive will automatically reduce frequency to prevent overload trips, which helps ride through short overload conditions without stopping the motor outright. If a hard overload persists, the drive will eventually fault to protect itself (displaying "PF" for current overload) [34]. This behavior can be thought of as an automatic stall prevention or "foldback" feature to keep the system running through brief load spikes.
- **Quiet Motor Operation:** The SCM drives use high frequency PWM for smooth output waveform. They feature an adjustable **carrier frequency** (switching frequency), typically up to 10 kHz or higher, which can reduce audible motor noise [35]. By increasing the carrier frequency (within the drive's thermal limits), the motor runs quieter – a useful benefit for noise-sensitive environments. The trade-off is slightly higher switching losses, so smaller drives often run at ~10 kHz by default for

silence, whereas larger units might use ~4 kHz default to manage heat. In practice, users can tweak this parameter to balance noise vs. cooling as needed.

Importantly, the **SCM series is configured to be** ready to use out-of-the-box **for basic applications** [36]. Lenze ships these drives with a default parameter set that suits a standard 2-wire run/stop and potentiometer speed control. For many simple uses, no programming changes are required – one can literally mount the drive, do the basic wiring, and immediately run the motor. This simplicity is a big plus for fast commissioning. Yet when custom behavior is needed, the rich set of parameters and I/O functions described above can be utilized to meet more complex control requirements.

Programming and Ease of Use (EPM Technology)

Lenze's AC Tech sub-micro drives, including the SCM series, put a strong emphasis on **easy setup and programming**. The front of each drive has a built-in 3-digit LED display and a few buttons for parameter programming and monitoring. This local interface allows full access to configure the drive. Users can scroll through parameter codes, adjust values, and read real-time data (like output frequency, current, etc.) on the display. For many, the **simple keypad interface** is more than sufficient to get the drive tuned for their motor and application.

Where the SCM series truly shines is the inclusion of Lenze's unique **EPM (Electronic Programmable Module)** memory technology. The **EPM is a small removable memory chip** (often a blue-colored module on the drive face) that stores all drive parameters. It offers several powerful benefits for the user:

- **Clone and Transfer Configurations:** With the EPM, you can **copy a programmed parameter set from one drive to another in** under two seconds [37] [38]**. This is done using an optional handheld EPM programmer device or by plugging the module into another drive. Remarkably, the target drive does** not even need to be powered up **to load the configuration** [39]**. This feature is extremely valuable for OEMs and systems integrators who have multiple drives to set up – you can program one drive, then simply duplicate those settings to all others almost instantly, ensuring** consistent setup and saving significant time**.

- **Quick Drive Replacement:** In the event of a drive failure or the need to swap a drive out, the EPM can dramatically **minimize downtime**. For example, a maintenance technician can **pull the EPM chip from a failed drive and insert it into a new drive**, which immediately transfers all the original settings. The new unit will be up and running with the correct configuration in moments, without having to manually reprogram parameters from scratch. This can turn what might be an hour or more of reprogramming into literally a **plug-and-play replacement**. Companies have found that this capability cuts mean-time-to-repair and avoids mistakes (since the parameters come over exactly as set originally). Lenze refers to the EPM as a "**Blue Chip investment**" because it provides this fast and error-proof cloning of the drive's "brain" [40] [41].

- **OEM Default Profiles:** An Original Equipment Manufacturer using SCM drives in their product can **pre-program custom parameter defaults** into the EPM for their application. In effect, the EPM can store an OEM-specific default configuration that the drive will revert to. This means if someone performs a factory reset, it can default to the OEM's settings rather than Lenze's generic default [42]. It's a useful way for OEMs to ensure that end-users can always restore the drive to a known-good

state tuned for the machine. It also simplifies field support, since swapping in a new drive + OEM EPM will automatically load the machine-specific profile.

- **PC-Based and Remote Programming:** In addition to the front keypad, Lenze offers software (TechLink) and the EPM programmer for PC connectivity. One can create or edit drive programs on a PC and then load them to the drive via the EPM module. The **optional remote keypad** accessory (described more in the next section) can also serve as a programming interface placed on a cabinet door, for instance. All these options underscore the drive's **focus on user-friendly commissioning**, whether you prefer front panel pushes or offline configuration.

The combination of straightforward **menu-driven programming** and the advanced EPM memory system means the SCM series is very **easy to deploy and maintain**. Technicians often praise that these drives "work right out of the box" and can be adjusted with minimal hassle – a clear advantage over some more complex VFDs that might require extensive parameter tuning or specialized software just to do basic tasks.

Design, Options, and Integration Considerations

From a hardware perspective, the Lenze AC Tech SCM drives are designed to be **installed inside electrical enclosures or machine control panels**, and their design reflects this purpose. They have an **IP20-rated** plastic case (vented, not dust- or water-proof by itself) which is intended to be mounted in a dry, cool area away from contaminants [13]. The compact form factor – often referred to as **"sub-micro" packaging** – means even the larger 10–15 HP units occupy relatively little space compared to older drive technologies. This makes them attractive for equipment builders trying to save panel space.

Some aspects of the physical design and available options include:

- **Layout and Connections:** The SCM series uses a **"contactor-style" layout** with **power terminals at the top** (for AC line input and DC bus) and **motor terminals at the bottom** (for the 3-phase output) [43]. This logical layout simplifies wiring in a panel (line in at top, motor out at bottom). Control terminals (low voltage I/O) are typically along the bottom front for easy access. All control terminals are isolated from line voltage for safety [44]. The drives come with DIN-rail mount capability or flange mounting holes depending on frame size, and Lenze even offers a **DIN-rail mounting kit** for certain models to snap them onto standard 35 mm DIN rails [45]. If cabinet depth or heat is a concern, **"through-hole" mounting versions** were available, allowing the heatsink to protrude out the back of a panel to dissipate heat externally [46]. This flexibility in mounting helps integrate the drives into different panel designs easily.

- **Dynamic Braking Option:** While the SCM drive provides DC injection braking by itself, for **applications that require very rapid deceleration or stopping of high-inertia loads**, a **Dynamic Braking (DB) kit** is available. The DC bus of the drive (terminals B+ and B−) can be tied to an external **braking resistor** module. Lenze offered a **pre-packaged DB resistor kit with the control electronics** needed [47]. This kit is easy to mount in the cabinet and connects to the drive's DC bus; during braking, the drive's transistor or the external chopper will engage the resistor to dissipate excess energy, allowing **faster stopping without tripping on overvoltage**. The inclusion of B+ and B− terminals on the SCM units means even these small drives can be upgraded for demanding stop times or regenerative loads when necessary. (It should be noted that the **standard SCM models did**

not include an internal brake transistor, so the DB kit was essential for dynamic braking – the kit likely contains the chopper transistor and resistor assembly.)

- **Electromagnetic Compatibility (EMC):** For installations that must meet strict EMC/RFI standards (particularly in Europe), Lenze provides solutions to ensure compliance. The **SCL series** is a variant of the SCM that comes with an **integral EMI/RFI line filter built-in**, specifically to meet **EN 61800-3 (EMC for drive systems) Class A** requirements for noise suppression [48] [13]. In fact, the "L" in SCL stands for this line filter addition. The SCL models are otherwise **identical to SCM** in function and range, but are limited to 240 V single-phase input models up to 3 HP, aimed at European single-phase applications [5] [49]. For other cases, or where an SCM is used, external **footprint filters** can be added. Lenze offered optional **snap-on EMI/RFI filters** (both single- and three-phase) that mount directly with the drive to mitigate conducted interference [50]. In practice, users in North America often may not require the filter for general use, but it's good to know this is available if you need to meet CE emissions standards or prevent noise issues on sensitive equipment. All SCM and SCL models are **UL listed** and **cUL listed** for use in the U.S. and Canada, and CE marked for Europe (with appropriate filtering).

- **Remote Keypad and Display:** An optional **remote keypad panel** can be used with the SCM drives for convenient operator interface. Lenze's remote keypad (model DKP or similar) can be mounted on a door or machine panel and is rated **NEMA 4/4X (IP65)** for washdown environments [51]. It duplicates the drive's start/stop, speed control, and programming functions on a handheld or panel-mount unit. This is particularly useful if the drive is located deep inside a cabinet or on a machine where local access is difficult – the remote keypad allows an operator to start/stop the motor and adjust speed or parameters from a more accessible location. The remote keypad communicates to the drive via a serial link and can even serve as the programming interface (the drive recognizes the remote and hands off control to it, indicated by a "SE" on the display for Serial mode [52]). Using a remote keypad can improve ergonomics and safety by not requiring access to the live electrical panel for routine adjustments.

- **Customization and Extensions:** The SCM series was designed to cover most needs without extra add-ons, but Lenze did have related models in the sub-micro family for more advanced requirements. (While direct network communication or vector control is not a built-in feature of the basic SCM, other siblings like the SCF or SCD series offered **Modbus RTU serial communications or DeviceNet** options, and the TCF series provided **sensorless vector** capability [53] [54]. Those are separate models; the SCM keeps things simple for general-purpose use.) For the SCM, about the only "extension" needed might be the aforementioned filters, dynamic brake, remote keypad, or a **potentiometer kit** for those who want a ready-to-mount speed dial. Lenze and third-party suppliers offered small potentiometer assemblies that could be panel-mounted and wired to the drive's analog input in minutes. In summary, the SCM can be seen as a **basic building block** – used standalone or enhanced with a few accessories to fit neatly into a wide array of control systems.

Advantages and Typical Applications

The Lenze AC Tech SCM series drives come with several **clear advantages** that help solve common motor control challenges:

- **Cost-Effective Motor Control:** The SCM series is **priced competitively**, making it feasible to use a VFD even in cases where traditionally one might not (for example, on a machine that previously ran a single-speed motor off a starter). Lenze actually notes that the SCM is *"cost-effective enough to be used with motors that do not require variable speed functionality"* [55] . In other words, even if you only need a soft starter or phase converter, an SCM drive can often fulfill that role for a similar cost, while also giving you the option of speed control. This provides **more value and flexibility** compared to using a simple starter or electromechanical controls.

- **Phase Conversion Capability:** One huge benefit is the ability to **run three-phase motors from single-phase power**. The SCM can act as a **phase converter** to create a balanced 3-phase output from a single-phase supply [56] . This is a lifesaver for small workshops, farms, or remote sites where only single-phase utility power is available, yet the equipment uses three-phase motors. Instead of derating the motor or using bulky rotary phase converters, an SCM drive lets you power the motor and *gain variable speed* as a bonus. (Do note that larger three-phase rated drives, if used on single-phase input, typically must be derated ~40% [57] – Lenze's recommendation for the SC series. For instance, a 10 HP three-phase model could support ~6 HP load on single-phase input. The product line covers up through 3 HP explicitly on single-phase without derating via the SCL models, and higher power single-phase applications can often be addressed by oversizing a three-phase unit.) This phase-conversion use case is extremely popular in retrofit scenarios – for example, converting an older milling machine or pump (3-phase motor) to run in a location with only 240 V single-phase supply. The SCM drive handles it gracefully while also providing soft start and speed control.

- **Eliminating Mechanical Speed Variators:** Many older systems achieve adjustable speed via mechanical means (such as belt-and-pulley variable drives, gearboxes, or eddy-current clutches) or by using two-speed motors. These solutions are often maintenance-intensive and limited in flexibility. The SCM drive offers a modern alternative – *electronic speed control with no physical adjustments*. Lenze highlights that the SCM *"virtually eliminates the need for 2-speed motors and starters and reversing starters"* [17] . With an SCM, a standard single-speed motor can run at any speed you command, and reversing is as simple as a digital input – no reversing contactor needed. This **reduces system complexity and points of failure**. Additionally, **soft starting** via the VFD reduces mechanical wear (belts, gears, couplings see far less shock compared to across-the-line starting). The net result is often longer equipment life and lower maintenance. For example, on a conveyor with a mechanical variable pulley drive, upgrading to an SCM VFD and fixed pulleys can eliminate periodic belt adjustments and replacements, and give a wider, stepless speed range.

- **Energy Savings:** Using a VFD like the SCM can lead to significant **energy savings**, especially in variable torque applications (e.g. fans and pumps). By reducing motor speed to only what is needed, the power drawn by centrifugal loads drops dramatically (following the affinity laws). Even though the SCM is a simple V/Hz drive, it can still be used to implement basic PID loop control for a fan or pump (with an external controller sending the speed reference) or at least to set an optimized fixed speed instead of running full bore. Many facilities have retrofitted HVAC blower motors or irrigation pumps with small drives like the SCM to cut energy usage during off-peak demand. The drive's

efficiency at full load is generally high (95%+), and at partial loads the inherent efficiency remains good, so most of the energy goes to the motor and work, not wasted as heat.

- **Fast Installation and Commissioning:** As discussed, the **out-of-the-box readiness and simple programming** mean that an SCM drive can be installed and set up in very little time, even by users who are not VFD experts. The included manual and **quick reference guide** provide straightforward wiring diagrams and parameter tables [18] [31]. For many common applications, only a handful of parameters (motor voltage, motor FLA, acceleration time) might need tweaking. The **integrated EPM** ensures that once one drive is configured ideally, cloning that setup to others or recovering it later is painless. All of this translates to lower commissioning costs and quicker production startup. An integrator can confidently incorporate these drives in their designs knowing that field setup will not be a headache.

- **Reliability and Support:** Lenze (formerly AC Tech) has a solid reputation for the reliability of these sub-micro drives. They are built with quality components and carry a **standard two-year warranty** from the manufacturer [58]. The design has proven itself over decades of use (the AC Tech sub-micro series has been on the market since the early 2000s and many are still running today). Additionally, if service is needed, the modular design (with replaceable EPM, cooling fans on larger units, etc.) makes maintenance straightforward. Lenze's documentation and support network are well-developed, and companies like Precision Electric (a Lenze distributor and repair center) can provide expert assistance with these drives. Overall, users can expect a long service life and **low total cost of ownership**, especially when considering the prevention of wear and tear on mechanical components that VFD soft start enables.

Typical applications for SCM series VFDs span across industries because of their general-purpose nature. Some examples include:

- **Conveyors and Material Handling:** Controlling conveyor speeds on packaging lines, baggage handling systems, or assembly lines. The SCM drive's presets and jog function are useful for indexing conveyors or switching between production rates. Soft start prevents product jostling and reduces motor sprocket wear.
- **Pumps and Fans:** Small water pumps, irrigation systems, or HVAC fans where full-speed operation is not always needed. An SCM can ramp the pump to avoid water hammer and adjust fan speed to control airflow or pressure. Even without built-in PID, it can be tied to thermostats or timers to implement basic variable flow control.
- **Machine Tools and Woodworking Equipment:** Retrofitting drill presses, lathes, mills, or saws that have three-phase motors so they can run on single-phase shop power. Users gain the benefit of variable speed for different materials, as well as a smoother start. For instance, a woodworker can use an SCM drive on a 3-phase **band saw** or **belt grinder**, powering it from 230 V single-phase and dialing in the optimal blade or belt speed for each material – improving cut quality and extending blade life. In fact, many hobbyist machinists choose the SCM (or similar Lenze drives) for exactly this purpose because of its affordability and proven durability in workshop conditions.
- **Food and Beverage Machinery:** Small mixers, feeders, labelers, or fillers often need simple speed control. The washdown-rated remote keypad can be mounted outside a stainless enclosure for operator adjustments in food processing environments, with the drive itself tucked safely away from moisture.

- **Agricultural Equipment:** Fans, augers, grain conveyors, and milking pumps in farms can benefit from VFD control. The single-phase input capability is crucial here, as many farms only have split-phase power. An SCM can, for example, drive a 3-phase grain auger motor gently (reducing belt breakage from jerky starts) and allow speed adjustment to match crop conditions.
- **Custom OEM Machinery:** Any custom-built machine that requires one or more small motors can use SCM drives as the standard motor controller. OEMs like using this series because they can integrate the drive into their electrical panel, set all the parameters via EPM for their machine's requirements, and ship it fully configured. The end user essentially gets a "plug and play" machine. If the user ever needs to replace the drive, the OEM can ship a pre-programmed EPM or drive+EPM that the user can swap in with minimal downtime.

In summary, the SCM series finds use in **virtually any scenario requiring a compact, economical VFD for motors up to ~15 HP**. Its versatility in handling different input voltages and its array of features mean one part number family can be used across many projects, simplifying support and inventory for companies that standardize on it.

Real-World Example Use Cases

To illustrate the impact of Lenze SCM drives in action, consider a couple of real-world scenarios (based on typical use cases) where these VFDs helped solve problems and improve performance:

- **Retrofitting a Conveyor System for Improved Control:** A manufacturing company had an **older conveyor line** driven by a 5 HP AC motor that was originally controlled by a simple across-the-line starter (fixed speed). This caused mechanical stress on gearboxes during startup and offered no speed flexibility – the line ran at one speed only. The company retrofitted each conveyor with a Lenze SCM drive. *Baseline:* Motor started full speed, occasional product jams due to abrupt starts, one-speed operation. *After retrofit:* Using the SCM VFD, they implemented a **soft-start with 5 s ramp** which eliminated jerkiness and reduced gearbox failures (the maintenance team reported a **20% increase in gearbox life** over a year of operation due to reduced shock loading). They also took advantage of the drive's preset speeds to allow **two operating speeds** – an **operator selectable "slow mode"** for delicate products and a normal speed for standard products. This improved the line's versatility and throughput. The **EPM feature** helped them copy the exact same settings to all 10 conveyors in the plant, *cutting commissioning time by an estimated 80% compared to programming each drive manually*. The investment in the drives paid off through **less downtime and more flexible production rates**, aligning with Lenze's claim that the SCM is a better solution than old mechanical or fixed-speed control [17].

- **Single-Phase Shop Powers Three-Phase Machine Tool:** A small machining business acquired a used **3 HP metal lathe** that came with a three-phase induction motor. Their facility had only single-phase 240 V service. Instead of replacing the motor or investing in a large phase converter, they installed a **Lenze SCM 3 HP drive** to run the lathe. *Baseline:* Lathe was inoperable on available power (single-phase); or would have required a noisy rotary phase converter and still have single speed. *After:* With the SCM drive, the owner was able to **run the 3-phase lathe from the 1-phase supply** easily [56]. Moreover, the VFD brought additional benefits: they can now **vary the spindle speed** smoothly using the drive's analog potentiometer input, rather than moving belts on pulleys for each speed change. For metalworking, this meant optimal surface speeds can be dialed in for different diameters and materials, improving finish quality. They also set up the drive's **reverse function** to

enable the lathe's threading mode without an elaborate gear change. The outcome was an *increase in productivity* – tasks like threading or polishing that previously required stopping to adjust belts are now done on the fly, contributing to an estimated **15% reduction in machining time per part**. The lathe also experiences **less mechanical wear** since hard starting and belt shifting are minimized. This example demonstrates how the SCM's phase-conversion capability and variable speed control helped a customer solve a power access problem and simultaneously modernize their machine's functionality [17] [59].

- **OEM Machine Deployment with Minimal Downtime:** An OEM that builds small **packaging machines** standardized on the Lenze SCM drive for driving various rollers and pumps in their equipment. Each machine uses four SCM drives (ranging 0.5–2 HP) for different sections. The OEM takes advantage of **EPM programming** to load a custom parameter set tailored to their machine's needs (including specific accel/decel times, preset speeds for different product recipes, and relay outputs tied into the machine's safety circuit). *Benefit:* During production, they program one machine's drives, then simply clone the EPMs for all subsequent machines, ensuring identical performance. Later, one of their customers had a drive fault after a power surge. Thanks to the OEM's foresight, the maintenance tech simply overnighted a spare drive to the customer and guided them to swap the EPM module from the old unit into the new one. The replacement drive was up and running immediately with **zero reprogramming** – resulting in **minimal downtime (under 30 minutes)** for the customer's packaging line. Had this been a generic drive without portable memory, the downtime would have been much longer, waiting for a specialist to re-enter dozens of parameters. This case highlights how the **SCM's design for quick configuration transfer** protects end-users from prolonged outages and keeps production running smoothly [37] [39].

Each of these scenarios shows the **practical value** delivered by the Lenze SCM series VFDs – whether it's solving a power supply constraint, extending equipment life, improving process control, or simplifying maintenance. The drives often **pay for themselves** through these improvements, underscoring why they remain a popular choice for small AC motor control projects.

Conclusion

The **Lenze AC Tech SCM series** variable frequency drives stand out as a well-balanced solution for low and medium horsepower motor control. They successfully blend **simplicity and advanced capability**: on one hand, an SCM drive is easy for anyone to hook up and run out-of-the-box for basic speed control; on the other hand, it has a rich feature set and clever tools like the EPM memory that more advanced users can appreciate for customization, rapid programming, and integration into complex systems. The **compact sub-micro form factor** coupled with wide power range and input voltage flexibility means one family of drives can cover numerous applications – **from a 1/3 HP single-phase powered fan to a 15 HP 480 V industrial pump** [3].

In operation, these drives deliver reliable **voltage/frequency control** of standard AC motors, providing smooth acceleration, **adjustable speed** for process optimization, and gentler stops – all of which improve the performance and longevity of mechanical systems. The inclusion of built-in motor overload protection, fault memory, and robust power electronics gives users confidence in the drive's **safety and durability** (backed by Lenze's two-year warranty) [58]. And when it comes to maintenance or scaling up a project, features like the **removable EPM and standard interfaces** make the SCM a **time-saving and user-friendly choice** in the long run.

Ultimately, the Lenze SCM series has proven itself as a **flexible, simple, and rugged** VFD solution – one that embodies the philosophy of providing just the right level of technology needed for the task (so customers aren't over-paying for features they don't use, yet have all the core functionality they *do* need) [60] [61]. Whether implemented in a new design or as an upgrade to existing equipment, the SCM drives enable improved control, energy efficiency, and problem-solving that can help customers achieve better outcomes with their motor-driven systems. It's this balance of **practical features, reliability, and cost-effectiveness** that continues to make Lenze's SCM series a go-to choice for countless applications worldwide.

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