



# Danfoss VFD Drives – Overview, Comparisons & Repair Options

## Introduction

Danfoss is one of the world's leading manufacturers of variable frequency drives (VFDs), offering advanced AC drive solutions for motors across industrial, commercial, and HVAC applications. Using VFDs like Danfoss's VLT® series allows precise motor speed control, which in turn saves energy and improves process control. In fact, by matching motor speed to demand, VFDs can often cut energy usage dramatically – a study of pumping systems found that using VFD control yielded **19-55% energy savings** (43% on average) compared to constant-speed operation ([Pumps & Systems, 2021](#)). Danfoss itself notes on its website that precise speed control can “*reduce energy consumption by up to 80%*” in certain applications ([Danfoss Drives – corporate site](#)). Beyond efficiency, VFDs reduce mechanical stress on equipment by providing soft-start and soft-stop capabilities, thereby extending the lifespan of motors, pumps, and fans. This article provides an in-depth look at Danfoss VFD products and technology, compares them with alternative brands, and explores when to consider repairing an existing drive versus upgrading to a new model – with real examples drawn from Danfoss and other major manufacturers.

## Overview of Danfoss VFD Product Lines

Danfoss Drives (part of Danfoss A/S) has been a pioneer in AC drives since the 1960s. Their flagship VFD family is the **Danfoss VLT® series**, which includes specialized models for different needs. For example, the **VLT AutomationDrive FC 302** is a general-purpose industrial drive designed to control all common motor types (induction, permanent magnet, servo, etc.) in manufacturing and automation. For the building HVAC sector, Danfoss offers the **VLT HVAC Drive FC 102**, which is tailored to pumps and fans with functions like a built-in cascade controller for multi-pump systems and a fire-mode override for smoke control. There is also the **VLT AQUA Drive FC 202** focusing on water/wastewater pumping applications, and compact Micro Drives (like the VLT MicroDrive FC 51) for smaller motors. Danfoss significantly expanded its portfolio in 2014 by acquiring Vacon, another major drive manufacturer, which added the **VACON®** line of drives. Today, Danfoss's VLT and Vacon products cover a wide spectrum of power – from fractional kilowatt units for small machines up to medium-voltage drives exceeding 1 megawatt for heavy industry. For instance, a single Danfoss VLT AutomationDrive can be as small as **0.25 kW** (1/3 HP) or as large as **1.4 MW** (~1900 HP) in output, with available supply voltages including 240 V, 480 V, 600 V, and 690 V AC (according to the [Danfoss AutomationDrive specifications](#)). This broad range allows users to standardize on Danfoss drives for many different motor sizes and power requirements.

Key features of Danfoss VFDs include robust design for harsh environments and user-friendly operation. Danfoss drives are known for their compact, efficient thermal design – the VLT AutomationDrive uses a “*cutting-edge thermal design and unique back-channel cooling*” concept that channels heat away from internal components, allowing a smaller enclosure and longer component life ([Danfoss AutomationDrive brochure](#)). Many models can operate at full capacity in ambient temperatures up to **50 °C without derating**, meaning no external cooling or oversizing is required for most installations ([Danfoss VLT HVAC Drive data](#)). In terms



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of environmental protection, certain Danfoss VFD models are offered in high ingress protection ratings (up to IP66/NEMA 4X), making them suitable for washdown areas or outdoor installations. To ensure reliability in industrial conditions, Danfoss uses optional conformal coating on circuit boards to protect against dust and humidity, and employs a ‘ruggedized’ mechanical design to withstand vibration.

On the control side, Danfoss VLT drives are praised for their ease of commissioning and integration. They support all common fieldbus protocols (EtherNet/IP, PROFINET, Modbus, BACnet, etc.), and use a modular plug-in option concept for I/O and communications, so that adding a protocol or I/O expansion is as simple as sliding in a card. Features like **Automatic Motor Adaptation (AMA)** allow the drive to auto-tune to the motor’s characteristics at start-up, and an **Automatic Energy Optimization (AEO)** mode can dynamically minimize energy use by trimming voltage without affecting performance. For safety, most Danfoss VFDs include built-in **Safe Torque Off (STO)** functionality to meet machinery safety requirements – this provides an integrated method to remove power to the motor without needing external contactors. Higher-end models can also offer safety options like Safe Stop 1 or Safely-Limited Speed via add-on modules. Danfoss even provides an Integrated Motion Controller (IMC) feature on the AutomationDrive, which enables basic positioning and synchronization tasks that might otherwise require a separate servo drive or motion controller. In essence, a Danfoss VFD can double as a simple positioning drive in applications like material handling or indexing conveyors.

Another strength of Danfoss VFDs is their emphasis on **power quality and grid compliance**. Danfoss drives come standard with features to reduce harmonic distortion and electromagnetic interference. For example, the VLT HVAC Drive FC 102 includes **integrated DC link chokes and RFI filters**, which *safeguard installations by minimizing harmonic distortion and electromagnetic interference* ([Danfoss HVAC Drive brochure](#)). These built-in components help users meet IEEE 519 harmonic limits and EMC regulations without needing bulky external filters. Danfoss also offers dedicated low-harmonic solutions – notably the **VLT Low Harmonic Drive**, which actively cancels harmonics. According to Danfoss literature, the Low Harmonic Drive “*meets all present harmonic standards and recommendations*” by continuously regulating its active filter to keep total current distortion low under all load conditions ([Danfoss VFD catalog](#)). Such features are increasingly important as facilities strive to minimize voltage distortion that can overheat transformers or disrupt sensitive equipment. In addition, Danfoss drives carry all relevant certifications for global use: UL and cUL listings for the US/Canada, CE marking for Europe, and compliance with the IEC 61800 series of standards for adjustable speed drive systems. In fact, Danfoss’s official conformity documents show compliance with **IEC 61800-5-1** (the international safety standard for power drive systems) and **IEC 61800-3** (EMC requirements) on its drive models ([Danfoss conformity declaration](#)). This means the drives are engineered to meet rigorous electrical safety, insulation, and electromagnetic compatibility criteria. Together, these design features make Danfoss VFDs a reliable choice for applications ranging from factory automation and pumping systems to commercial HVAC and marine propulsion.

## Energy Efficiency and Standards Compliance

The primary motivation for using VFDs like Danfoss VLT drives is often energy efficiency. By varying a motor’s speed to match the required load, significant energy savings can be achieved, especially in variable-torque applications such as fans and pumps. It is well documented that due to the affinity laws, power draw drops roughly with the cube of speed for centrifugal loads. This means even a modest reduction in speed can yield large energy cuts – for example, slowing a fan by 20% (to 80% of full speed) can reduce its power consumption by nearly 50% ([Eaton VFD Guide – cube law example](#)). Danfoss builds on this principle with features like the Automatic Energy Optimization (AEO) mode mentioned earlier, which continuously fine-



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tunes the motor voltage to the minimum needed for the load, avoiding wasted energy. Their drives also often include energy monitoring readouts and sleep modes for pump systems (automatically stopping the motor during no-flow conditions). Beyond individual features, Danfoss promotes VFD adoption as a key strategy for companies to reach sustainability and carbon reduction goals, pointing out that efficient motor control can translate directly into reduced electricity usage and CO<sub>2</sub> emissions.

To fully realize these benefits, it is critical that both the drive and the motor are properly specified and meet industry standards. Modern VFDs, including Danfoss's, are designed in compliance with strict international standards. As noted, **IEC 61800-5-1** governs the electrical and fire safety aspects of drive systems – covering everything from insulation coordination and grounding, to protection against overloads and short-circuits. Danfoss VFDs conform to this standard, which reassures users that the drives have appropriate internal protections and have been tested for safe operation under fault conditions. Likewise, EMC standard **IEC 61800-3** ensures that a drive will not emit excessive interference back onto the mains or into the environment, and Danfoss includes built-in mitigation (filters and chokes) to meet those limits.

Another important standard is **IEEE 519** (for harmonics in power systems). While not a legal requirement, many facility engineers use it as a best-practice guideline to keep total harmonic distortion (THD) at acceptable levels (often, THD <5% at the point of common coupling). Standard Danfoss drives with 12-pulse front ends or with integrated DC link chokes typically can help meet IEEE 519 in many scenarios, and the dedicated Low Harmonic Drive mentioned earlier guarantees compliance even on weaker power systems. For end users, this means a Danfoss solution can help avoid the extra losses, heating, and potential equipment malfunctions that excessive harmonics might cause.

The **motor** side of the equation must not be overlooked: running motors on VFDs imposes additional stresses such as higher frequency voltage pulses and cable-reflected wave spikes at the motor terminals. To address this, NEMA (National Electrical Manufacturers Association) provides guidelines for “inverter-duty” motors. **NEMA MG-1 Part 31** requires that motors intended for VFD use (for example, a standard 460 V AC motor) have insulation systems capable of withstanding around **1,600 V peak** voltage surges with very fast rise times (0.1 microsecond), among other criteria ([JP Motors – NEMA MG1 summary](#)). In practice, this ensures the motor's wire insulation will not be damaged by the rapid-fire PWM voltage pulses from the drive. Users should verify that their motors meet this inverter-duty standard (often indicated as “Inverter Ready” or “Meets NEMA MG1 Part 31” on the nameplate or documentation), or else use appropriate output filters (such as dV/dt filters or sine-wave filters) especially for long motor cable runs. Many modern motors are built to comply with MG-1 Part 31, but when retrofitting an older motor with a new VFD, this check is critical. Leading repair and integration services, like Precision Electric, also emphasize ensuring motors are of the proper insulation class and that VFD output filtering is applied if needed, to guarantee longevity and performance of the motor-drive system.

In summary, Danfoss VFDs are engineered for high efficiency and are aligned with industry standards out of the box. When installing or servicing these drives, adhering to guidelines such as IEC 61800 and NEMA MG-1 helps ensure the system will operate safely and reliably. It's advisable to partner with knowledgeable suppliers or service providers who understand these standards – they can recommend the right ancillary equipment (line reactors, harmonic filters, inverter-duty motors, etc.) to fully optimize the drive installation for both efficiency and compliance.



## Comparing Danfoss VFDs with Other Brands

Danfoss is one of several top-tier VFD manufacturers globally, alongside brands like **ABB, Yaskawa, Siemens, Rockwell (Allen-Bradley), Schneider Electric, Eaton, Hitachi, Mitsubishi, Lenze**, and others. Each of these companies offers a broad range of AC drives with overlapping capabilities, but they also have unique strengths or industry focuses. For a buyer or engineer, it is useful to understand how Danfoss drives stack up against some peers:

- **ABB** – A Swiss-based global leader, ABB is known for very robust drives (the ACS series) and a worldwide support network. ABB drives often emphasize reliability and easy integration into automation systems. ABB has also highlighted the high cost of downtime as a reason to invest in quality drives and maintenance: a 2023 ABB survey of industries found that unplanned outages cost the typical business around **\$125,000 per hour** on average ([ABB “Value of Reliability” Survey, 2023](#)). This underscores why many factories trust brands like ABB or Danfoss that have proven durability and strong service offerings. In terms of features, ABB’s latest low-voltage drives (e.g. the all-purpose ACS580 or the high-performance ACS880) offer similar capabilities to Danfoss VLT drives: broad connectivity, advanced control algorithms, and safety options are all standard. One difference might be the user interface and ecosystem – ABB drives integrate tightly with ABB PLCs and use ABB’s DriveManager software, whereas Danfoss has its own toolset (MyDrive® Suite) and is very prevalent in HVAC and refrigeration sectors thanks to application-specific features. Ultimately, choosing between ABB and Danfoss often comes down to plant standardization and support: both are reputable, and many service providers (like Precision Electric) are capable of supporting **either** brand.
- **Yaskawa** – A Japan-based manufacturer, Yaskawa is often praised for its exceptional quality and reliability. Yaskawa drives (such as the GA800 and GA500 series) are known to run for many years with minimal issues, and historically Yaskawa has published some of the highest meantime-between-failure (MTBF) figures in the industry. Yaskawa drives tend to have a straightforward design focused on core performance and longevity. Like Danfoss, Yaskawa offers user-friendly setup wizards and auto-tuning, and their newer models include advanced capabilities (for instance, the GA500 can run permanent magnet motors without feedback and offers mobile app programming). One area where Yaskawa stands out is in compact micro-drives for smaller motors – they pack a lot of power and features into small form factors. A difference might be market focus: Yaskawa is very strong in Asia and North America for industrial and OEM applications, while Danfoss has an enormous presence in HVAC and pumping systems globally. Both brands, however, have global reach and top-tier reliability. An illustrative example of Yaskawa’s reliability approach: during the 2022 semiconductor shortage, one beverage facility couldn’t afford any VFD downtime on its bottling line, so they **stocked a Yaskawa GA500 drive as a universal spare**. Because the GA500 can be quickly reprogrammed to work in many motor applications, when a drive did fail, the plant was able to swap in the GA500 and continue running, avoiding a costly shutdown ([Precision Electric case example](#)). Danfoss drives can similarly be used as drop-in replacements in many cases, but Yaskawa actively promotes this “one spare for many drives” concept given the versatility of some of its models.
- **Eaton** – Eaton is a diversified power management company (known for electrical equipment like breakers and UPS systems) that also offers a line of VFDs, particularly popular in North America. Notably, some of Eaton’s drive product lines have been **built through OEM partnerships** – for



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example, the older **Eaton SVX9000** series was actually the same hardware as a Danfoss VLT drive (the Danfoss VLT *NXS* line) with different branding. In other words, Eaton's SVX9000 was built by Danfoss and is essentially identical to a Danfoss unit internally ([Precision Electric drive cross-reference](#)). This cross-brand similarity means that in some cases a failed Eaton drive can even be replaced by the equivalent Danfoss model (or vice versa) without major modifications. In one HVAC application, an Eaton SVX9000 that controlled a large air handler failed after the product was discontinued, so engineers obtained the corresponding Danfoss VLT drive and found it was nearly a plug-and-play swap because the two are the same under the hood ([Precision Electric case study](#)). The building's cooling was restored within a day, and the original Eaton unit was later repaired and kept as a backup. Eaton's current drives (like the PowerXL DG1 series) are the company's own designs, emphasizing ease of use (with a simplified menu structure and PC software) and integration with Eaton power distribution products. They target similar markets as Danfoss's general-purpose drives. For end users, the key takeaway is that expertise in one brand can often translate to another – service providers familiar with Danfoss, for example, can readily support Eaton drives, and they know handy tricks like the interchangeability of certain legacy models, which can greatly reduce downtime.

- **Hitachi** – Hitachi Industrial produces reliable compact drives that have been popular in light industry and OEM equipment. Their prior flagship was the **Hitachi WJ200** series of microdrives, which offered sensorless vector control and decent overload capacity in a small footprint (commonly used up to ~20 HP). In 2024, Hitachi began phasing out the WJ200 in favor of the new **WJ-C1** series, which is a drop-in replacement with updated technology and a similar form factor (the WJ-C1 is footprint-compatible with the WJ200) as announced by Hitachi's distributors. In comparison to Danfoss, Hitachi drives are often more bare-bones in terms of interface (the WJ200 had a basic 3-digit display and required parameter codes, whereas Danfoss drives have multi-line graphical displays or at least more text-based codes). Feature-wise, Hitachi drives cover the essentials and offer good performance for the price, but they might not have some of the high-end options or extensive power range that Danfoss (or others like ABB, Siemens) provide. One notable aspect is cost – Hitachi drives tend to be very competitively priced, which appeals to equipment builders. However, if a Hitachi drive in the field fails and the model is obsolete, upgrading to the new model might require some wiring or programming adjustments. An example scenario: a manufacturing line was running on a Hitachi WJ200 drive that began faulting intermittently around the time Hitachi announced the WJ200's end-of-life. Instead of immediately purchasing the new WJ-C1 model (which had a lead time of several weeks and would have required minor wiring changes), the maintenance team sent the WJ200 to a repair center. The shop replaced a failing transistor and refreshed the DC bus capacitors, then fully tested the drive. It was returned in just **4 days**, and production resumed without the need to re-engineer anything – the repair cost was a fraction of a new drive's price, and it bought the plant several more years of use from that equipment ([Precision Electric repair case](#)). This underscores how third-party repair services can support older models even after the OEM has moved on to a successor. (Of course, eventually the plant will likely upgrade to the WJ-C1, but on their own schedule rather than in a crisis.)
- **Lenze** – Lenze is a German drive and automation company whose VFDs (e.g. the **Lenze 8200** and later **8400** series) are widely used in Europe, especially in machinery like packaging, printing, and material handling systems. Lenze drives are known for their compact design and strong integration with Lenze's broader automation offerings (motion controllers, servo systems, etc.). A unique aspect of Lenze's VFDs is their focus on **application-specific functionality** – for example, they have built-in



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positioning and sequence control functions that cater to machinery builders. In terms of comparison, Lenze's hardware quality and performance are high (on par with other German brands like Siemens or SEW), but their market share in North America is smaller relative to Danfoss or ABB. One challenge is lifecycle management: Lenze, like others, periodically retires old product lines. The Lenze 8200 Vector drive, for instance, was a workhorse in the 2000s but was eventually withdrawn around 2017 to make way for the 8400 series and comply with new regulations (RoHS, etc.). If a facility still uses 8200 drives, they might face difficulties sourcing parts or units. A real example illustrates how this can be handled: a plastics company had a Lenze 8200 drive that kept tripping a GFCI (ground-fault circuit) breaker whenever it ran at high speed, causing nuisance shutdowns. A Precision Electric field engineer recognized the symptom – the drive's internal RFI filter was leaking current to ground and triggering the sensitive GFCI. The immediate fix was to **disable or re-wire the EMI/RFI filter and add output ferrite chokes** on the drive's output. After this service, the modified drive no longer tripped the GFCI ([Precision Electric case](#)), restoring reliable operations. Additionally, knowing the 8200 was obsolete, the team prepared for the future by sourcing a Lenze 8400 drive (the 8200's successor) to have on hand. They confirmed it could drop into the same space with only minor parameter adjustments. By resolving the immediate issue and planning an upgrade path, the repair service helped the customer avoid unplanned downtime and gave them a roadmap for eventual replacement on their terms, rather than during an emergency.

Overall, all major VFD brands today provide high-performance, feature-rich drives. They all must meet the same basic standards (UL, IEC, etc.) and typically offer similar core functionality like vector torque control, programmable I/O, various communication options, and protective features. The differences often lie in the details of implementation – e.g. one brand's programming software vs. another's, slight variations in how features are delivered, or the ecosystem of support and service around the product. Danfoss VFDs distinguish themselves with their strong focus on energy efficiency features, their longevity and dominance in certain segments (like HVAC and refrigeration), and innovations such as back-channel cooling and integrated condition monitoring. But ABB, Yaskawa, Schneider, Siemens, and others likewise have unique offerings (for instance, Schneider's Altivar Process drives include embedded web servers, Siemens drives integrate seamlessly with TIA Portal, Yaskawa emphasizes extremely high MTBF and support). In practice, when a Danfoss drive isn't readily available or if a customer has a legacy preference, a comparable drive from another top brand can often be used with minimal impact – the key is ensuring compatibility in power rating and control features. Companies like Precision Electric regularly assist customers by **cross-referencing VFD models** between manufacturers and suggesting functional equivalents (for example, recommending an ABB ACS580 or an Eaton DG1 to replace a certain Danfoss model if needed). This flexibility can be a lifesaver when lead times are long or an exact replacement is no longer made.

## Repair vs. Upgrade: Making the Right Choice

When a VFD like a Danfoss drive fails or starts to show problems, plant personnel must decide whether to **repair the drive or upgrade to a new one**. Each approach has its merits, and the best choice depends on factors such as the drive's age, the severity of the issue, replacement availability, budget, and how critical the process is.

**Repairing a drive** can be an excellent option, especially if the drive is not too old or if a direct replacement is expensive or hard to get quickly. Professional VFD repair services can often fix issues ranging from blown power transistors (IGBTs), to failed capacitors, to fried control boards – typically at a fraction of the cost of buying a new drive. For example, in the Hitachi WJ200 scenario mentioned earlier, the repair was completed



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in about four days and cost much less than a new unit ([Precision Electric case study](#)). This rapid turnaround prevented a prolonged line shutdown. Similarly, repair technicians can extend the life of high-value drives (such as a large 500 HP Danfoss VLT drive) by replacing aging components like DC bus capacitors, cooling fans, and opto-couplers – essentially refurbishing the unit for many more years of service. Many industrial electronics companies, including Precision Electric, complete **over 95% of VFD repairs in-house**, using advanced diagnostic equipment and genuine-quality components, which enables quick turnaround times ([Precision Electric – VFD Repair Services](#)). Repair is particularly attractive when the drive in question is obsolete or has a long lead time for a new replacement. Rather than re-engineering the system to accept a different drive, a repair can buy time and keep production running. It's also often the more budget-friendly choice: repairing a drive might cost only 20–50% of the price of a new one.

On the other hand, **upgrading to a new drive** brings advantages that a repair cannot. A new-generation VFD will come with the latest technology – possibly improved efficiency, better user interfaces, new features (like built-in Bluetooth connectivity or advanced safety functions), and a full factory warranty. If a drive has been in service for 15-20 years, even if it can be repaired, one must consider that other components could fail in the near future due to age. In cases where high uptime is crucial, a proactive replacement might be the safer long-term strategy. The example of the ABB drives at the pulp mill is illustrative: the mill replaced twenty older ABB ACS550 drives with new ACS580 models during a planned outage, dramatically reducing unplanned drive failures (a 76% reduction in drive-related downtime) and then kept the old drives as emergency spares ([ABB upgrade case via Precision Electric](#)). By moving to newer models, they not only increased reliability but also gained modern features (the new drives were network-enabled, whereas the old ones had limited connectivity). Danfoss users might consider a similar approach – for instance, upgrading an aging Danfoss VLT 5000 or 6000 series drive to the current VLT AutomationDrive FC 302 series will yield improvements like higher energy efficiency, better harmonic performance, and updated communications options (plus easier access to spare parts down the road).

There is also the question of capacity and future-proofing. Upgrading can allow a facility to standardize on a current platform, simplifying maintenance (common spare parts, uniform software tools for all drives). If expanding a system or process, it might be wise to invest in new drives that can handle anticipated loads or provide new capabilities, rather than repairing older drives that might soon become a bottleneck. New drives often have enhanced diagnostics and communication abilities (e.g. Danfoss's latest drives support cloud connectivity and have enhanced data logging, which older models lack), which can be invaluable for predictive maintenance and integration into modern plant control systems.

**Cost and downtime** considerations often tip the scale one way or the other. If a drive failure occurs and a new replacement drive is sitting on the shelf (or can be obtained overnight), many companies will opt to install the new drive immediately to restore operation. However, if the new drive is a different model or brand, the engineering time to retrofit it (adapting mounting hardware, changing wiring, reprogramming drive parameters and any PLC logic) must be factored into the downtime. In contrast, sending a drive out for repair might take a few days, but if the process can run in a limited fashion without that drive (or if a temporary bypass or spare is available), that might be acceptable. This is where having a **trusted repair service and possibly a spare drive** in inventory comes into play.

Many organizations adopt a hybrid strategy: they keep a few critical spare drives (which could even be a versatile drive from a different brand that can be adapted) to immediately swap in when a drive fails, and then send the failed drive for repair. Once repaired, that drive becomes the new spare on the shelf. The earlier Eaton/Danfoss HVAC case is a perfect example – they installed a spare Danfoss drive to get the



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system back up within a day, and then had the failed Eaton unit repaired and stored as a backup for the future ([cross-brand replacement case](#)). This approach ensured zero process downtime beyond the initial failure and actually improved their readiness for any future issues.

Ultimately, the decision to repair or upgrade is case-specific. **Repair** makes sense if the drive is relatively modern (or very expensive to replace), if time is available for a quality repair, and if the rest of the system is not changing. **Upgrade** makes sense if the drive is old, if newer technology offers significant benefits, or if the risk of recurring failures is high. In many situations, doing a short-term repair and planning a long-term upgrade is the smartest path – fix the immediate problem cost-effectively, but also schedule an upgrade in the next budget cycle to enhance overall system reliability.

### Precision Electric's VFD Repair and Support Services

For facilities running Danfoss VFDs (or any major brand of drives), having a reliable service partner is crucial. **Precision Electric, Inc.**, based in Indiana, specializes in both VFD repair and drive replacement solutions. They offer **24/7 emergency support** for critical failures – meaning you can get expert help and begin the repair or replacement process at any hour of the day or night ([Precision Electric – VFD Repair Services](#)). While not every drive can be fixed immediately (especially if specialized parts are required), the goal is to minimize downtime. Precision Electric reports that it completes **99% of VFD repairs in-house**, using state-of-the-art testing equipment and quality components, which ensures prompt turnaround and competitive pricing for customers ([Precision Electric – VFD Repair Services](#)). Every repaired drive is fully tested under load, and repairs come with a 12-month in-service warranty, meaning the drive is guaranteed to perform reliably when put back into operation.

When an immediate repair is not feasible (for example, if a drive has catastrophic damage or if required components have long lead times), Precision Electric can often provide a **replacement drive** to keep the facility running. They maintain an inventory of common drives and can cross-reference and source equivalents for many others. In practice, this means if a Danfoss VFD fails and a new Danfoss replacement is not quickly available, Precision Electric might supply a comparable drive from ABB, Yaskawa, Eaton, or another brand that can be installed to fill the gap. Their engineers are adept at configuring the replacement so that it matches the original drive's settings and control scheme. For instance, if a Danfoss VLT HVAC drive goes down, they could furnish an ABB ACH580 (HVAC drive) of the same rating and help adapt the wiring and parameters so that the motor and building automation system see no difference. This kind of **cross-brand support** can be a lifesaver to avoid extended HVAC outages or production downtime. (As discussed earlier, knowing that certain Eaton and Danfoss models were identical has allowed Precision Electric to swap those interchangeably in urgent situations.)

Precision Electric also provides on-site services such as installation, commissioning assistance, and preventive maintenance. They can dispatch technicians to install a drive or to pick up a failed unit for expedited repair. Preventively, they offer services like thermal imaging, capacitor health checks, and cleaning of VFD units to reduce the chance of failures. Additionally, they help clients plan **obsolescence management**. For example, they can audit all the drives in a plant, identify which models are obsolete or nearing end-of-life, and then recommend a phased upgrade strategy so that those older drives are replaced on a scheduled basis rather than waiting for failure. This approach, combined with keeping strategic spares on-site, can virtually eliminate unplanned VFD downtime. It's the same philosophy described in Precision Electric's online guides: classify drives by risk, budget for replacements starting with the highest-risk (oldest or most critical) units, and take advantage of modern replacements that often bring efficiency gains as well



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([Precision Electric Obsolete Drive Guide](#)). By being proactive, plants can turn what would be crises into routine maintenance events.

In emergency scenarios where a VFD failure has halted production, **time is money** – recall the ABB survey figure of \$125k per hour of downtime. Precision Electric's ability to respond around the clock, either with a fast repair or an immediate replacement, can save enormous costs in lost production. Even if a same-day fix is not always possible (for instance, a very large drive might require a day for thorough testing after repair), they strive to have the drive back in operation in the shortest time feasible – often within 24 to 72 hours for urgent cases. They also keep customers informed and may suggest temporary workarounds (such as running a motor across the line at full speed, if possible, while a drive is being serviced) to mitigate impacts.

In summary, Precision Electric supports Danfoss VFD users (as well as users of ABB, Allen-Bradley, Siemens, Yaskawa, and other drives) by offering expert repair services, rapid exchange or replacement options, and technical guidance on drive upgrades. Whether you choose to repair a faulty Danfoss drive or upgrade it to a new model, their team can help ensure the process is smooth and downtime is minimized. The combination of well-engineered products like Danfoss VFDs and strong technical support from providers like Precision Electric gives end users the best chance to keep their operations running efficiently, with high uptime and optimized energy usage.

## References

1. **Danfoss** – “VLT® AutomationDrive FC 301/302” – Product page and brochure for Danfoss AutomationDrive, listing features (e.g. back-channel cooling) and power ranges (0.25 kW up to 1.4 MW). [Link](#)
2. **Danfoss** – “Enhanced VLT® HVAC Drive FC 102” – Product page for the HVAC-specific VFD, noting operation at 50°C without derating, IP66 options, and built-in chokes/filters for harmonics/EMI. [Link](#)
3. **Danfoss** – *Drive Conformity Declaration* – Official compliance certificate indicating Danfoss drives meet IEC 61800-5-1:2007 (safety) and IEC 61800-3:2004 (EMC) standards, among others. [Link \(PDF\)](#)
4. **JP Motors & Drives** – “NEMA MG1 Guidelines for Adjustable Speed/Motor Applications” – Article explaining NEMA MG-1 Part 31 requirements (e.g. motor insulation must withstand 1600 V peak spikes at 0.1 μs) and other considerations when using standard motors with VFDs. [Link](#)
5. **Pumps & Systems Magazine** – Tyler G. (2021), “VFD Studies Suggest Cost Savings for Chemical Systems”. Reports on a study (by the Cadeo Group for NEMA) showing variable-speed pump systems saved 19–55% energy (43% average) vs. constant speed, with payback ~4–10 months. [Link](#)
6. **Danfoss VFD Catalog** – “VLT® Drives Product Overview” – Catalog excerpt highlighting the VLT Low Harmonic Drive. States that it meets all current harmonic standards by using an active filter to keep THD low under all conditions. [Link \(PDF\)](#)
7. **ABB Motion** – Press Release: “ABB survey reveals unplanned downtime costs \$125,000 per hour” (Oct 11, 2023). Summary of global survey (“Value of Reliability”) quantifying downtime costs and emphasizing maintenance strategies; median outage cost reported as \$125k/hour. [Link](#)
8. **Precision Electric, Inc.** – “VFD Replacement Guide: Handling Obsolete Drives & Lead Times” (Craig Chamberlin, June 2025). Online guide on dealing with drive obsolescence. Discusses cross-brand replacements (e.g. Eaton SVX9000 = Danfoss VLT NXS), planning upgrades, and examples like an ABB upgrade (cut failures 76%) and a facility using a Yaskawa GA500 spare to avoid downtime. [Link](#)
9. **Precision Electric (Case Studies)** – “Variable Frequency Drive Repair Services” (2025 Whitepaper/PDF). Detailed real-world examples of VFD repair and replacement success stories across brands: **Hitachi WJ200** repaired in 4 days vs. waiting for new WJ-C1; **Lenze 8200** EMI issue fixed and prepared for



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upgrade; **Eaton/Danfoss** HVAC drive swapped (Danfoss spare used for failed Eaton); **ABB** pulp mill proactive upgrade; **Yaskawa** GA500 spare strategy, etc. [Link \(PDF\)](#)

10. **Precision Electric, Inc.** – *“Variable Frequency Drive Repair”* (Service page, updated 2018). Describes Precision Electric’s 24/7 emergency repair services, free evaluation quotes, in-house repair capabilities (99% of drives repaired internally), and 12-month repair warranties. [Link](#)
  11. **Danfoss** – *“Danfoss Drives: World-leading drive manufacturer”* (Corporate site page). Highlights Danfoss’s focus on efficiency, stating that using VFDs can reduce energy consumption by up to 80% in motor systems, and outlines broad benefits of drives in decarbonization and productivity. [Link](#)
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