Eco‑truxure™
Innovation At Every Level

Unlock new levels of logistics agility

How universal automation speeds step-change operational advancements by removing technology constraints

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Life Is On | Schneider Electric

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Within the logistics industry, automation architectures have remained fundamentally unchanged over the last 30 to 40 years. These systems have grown organically, layer upon layer, over time. The foundational architecture, never designed with today's technology in mind, struggles to accommodate increasingly complex business challenges. As a result, business agility has suffered as these systems are relatively closed, proprietary, siloed, and difficult to manage. The ramifications of continuing to operate such systems include:

- The systems become more time consuming to optimize and maintain over time.

- The lack of openness makes many of the systems in place today costly and complex to modify. It also stifles innovation and, as a result, business agility suffers.

- Step-level changes in productivity, efficiency, and profitability are not possible due to system-imposed restrictions. Such systems are not future-proof.

This e-guide explains how a new approach, **universal automation**, removes the constraints limiting logistics performance, and how a breakthrough new approach to automation, based on an open standard, enables unprecedented efficiency and flexibility for logistical operations.

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If we were going to perform a clean state design of a state-of-the-art logistics control system today to match modern logistics operations, it would bear little resemblance to the complex, inflexible proprietary systems of today.

Traditional control technologies were never designed with connected agile operations in mind, resulting in large overhead costs for brownfield facility maintenance, and greenfield builds that are not significantly more efficient.

The answer to building state-of-the-art control systems that support a step-change in logistics operations productivity and efficiency lies in three key capabilities provided by IEC 61499, an exciting modern evolution of existing automation standards:

1. **Universal automation** – This concept promotes software-centric and asset-centric automation, the wrap and reuse of existing systems, and introduces a new generation of "plug and produce" portable and interoperable solutions. Universal automation optimizes IT/OT convergence and sets the stage for self-configuring, self-healing, fast retooling systems that drive speed and agility.

2. **Open systems** – Logistics businesses require open data exchange and easy reusability of programming objects in order to enhance operational speeds. Simpler two-way linkages between disparate systems are a precursor for a truly open platform.

3. **Object oriented programming** – This approach structures a software program into simple, reusable pieces of code to make systems more affordable and faster to implement.

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Capitalizing on evolved standards

The [IEC 61499](#) standard was originally developed in the late '90s and early 2000s. Today, given the broad acceptance of trends such as digitization and the industrial internet of things (IIoT), the time has come to derive the standard's benefits.

Acceptance of and adherence to the standard results in a number of significant business advantages:

- **Increased portability** – Easier movement of compiled objects between runtime systems from different vendors

- **Enhanced interoperability** – Better capability to communicate openly between vendor runtimes

- **Lower total cost of ownership** – By allowing simplicity of deployment, plug and play connectivity, the smooth coupling or decoupling of hardware and software, and a seamless and easy upgrade path, logistics firms stand to dramatically reduce control system modernization implementation costs across both brownfield and greenfield environments.

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Supply chains are shifting towards a logistics environment that is faster, more flexible, personalized, more accurate, and highly efficient. In order to accommodate these marketplace challenges, logistics organizations need fast access to comprehensive data. The ability to access and process that intelligence gives logistics companies a substantial competitive edge, but the foundation to enable such access needs to be built now. Effective supply chain management is inconceivable without the optimization of companies' logistics operations.

Logistics challenges that IEC 61499 and related universal automation solutions, like EcoStruxure™ Automation Expert, address include:

1. Faster response times

2. More intelligent operations

3. Enablement of an omnichannel environment

4. More agile processes

5. End-to-end tracking

Existing proprietary architectures, which rely on the older IEC 61131 standard, are unable to efficiently address these challenges. Data from proprietary vendor systems can be difficult to access and transfer which increases cost and wastes time.
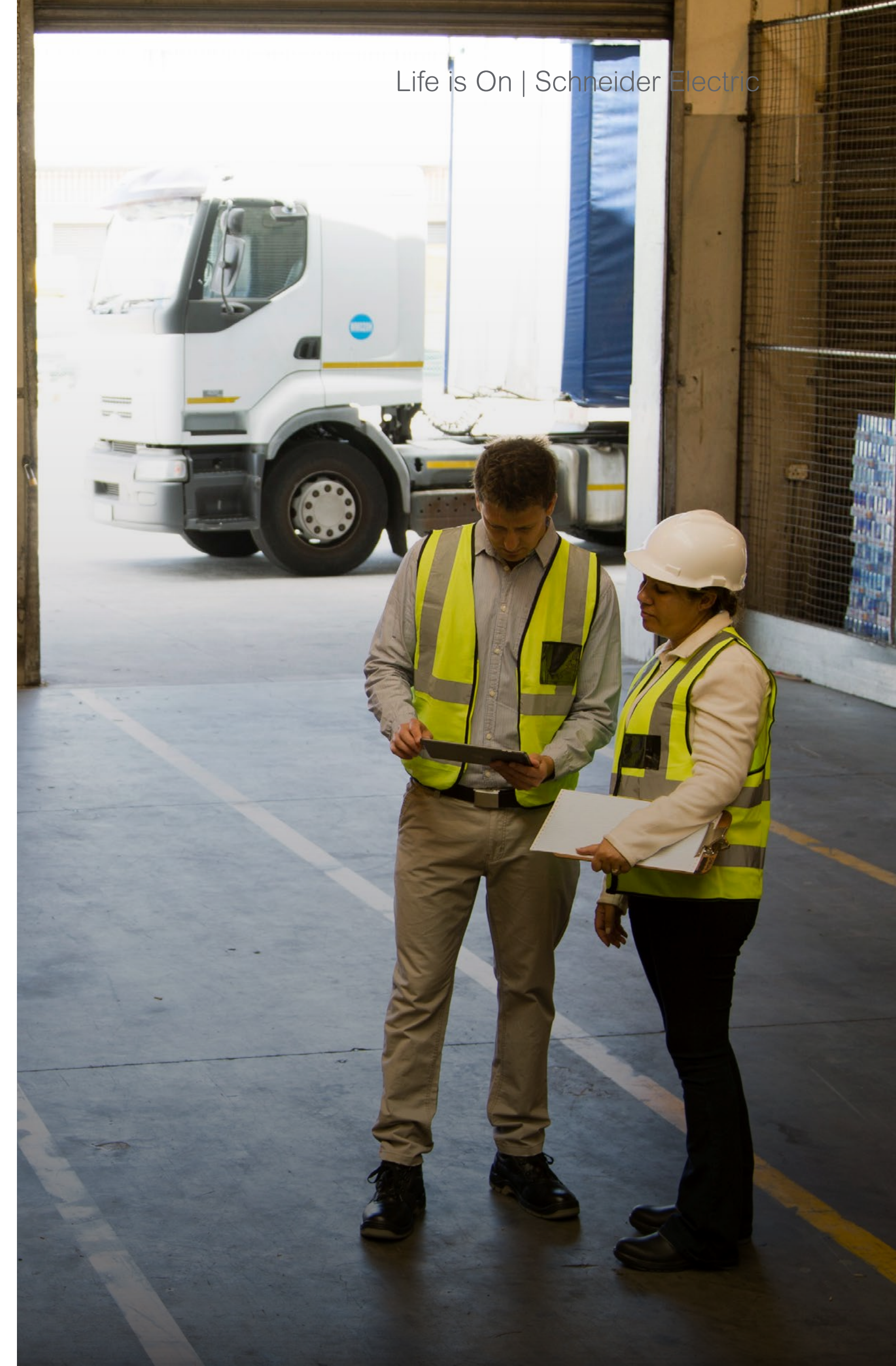
Logistics industry applicability

Logistics subsystems that can benefit the most from IEC 61499-based universal automation, like EcoStruxure Automation Expert, include roller and belt transport conveyors, pallet storage subsystems such as those that handle oversized B-to-B goods, order preparation mechanisms, and low-speed sorters (including encoders and transport conveyors that support pallet make-up operations).

Below is an example of how universal automation systems could speed supply chain logistics and delivery operations:

• Increased control tower flexibility and visibility – universal automation-enabled open communication between intelligent

devices, edge control and the control tower would allow logistics firms to collect the kind of information needed to optimize performance of local, regional, and international distribution centers.

When experiencing a supply issue in one distribution center, for instance, operators can more easily detect the issue and source materials from another center to adapt and balance the system as a whole. This results in faster action and helps the overall supply chain to respect the committed delay.

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Ease of programming is key

The event-driven function block structure of IEC 61499 mimics the IT notion of object methods and parameters. Object-oriented programming is a key characteristic of the software components that are the fundamental building blocks of universal automation solutions.

An object can be defined as a data field that has unique attributes and behavior. Object-oriented programming focuses on the objects that developers want to manipulate rather than the logic required to manipulate them.

For instance, engineers working on logistics automation systems can build or reuse a set of objects related to an application. In addition, regardless of the number of controllers involved, engineers only need to work within the confines of one application. This saves time by avoiding having to program each controller individually. The object can be generated with 3D simulation software. The link between the edge control object and the 3D animated object provides a useful digital twin that can follow the system throughout the lifecycle, from engineering to the estimated end of life.

Logistics industry applicability

The abstraction of system, device, and resource models enables applications to be designed independently of the underlying automation hardware, to be distributed across heterogeneous devices efficiently. These devices can then interoperate following standardized communications/data models across networks (without additional programming).

Requirements such as flexibility, adaptability, or robustness, which are not optimally addressed by existing design methods, are greatly enhanced by the open nature of IEC 61499-based universal automation solutions.

A universal automation solution

A universal automation solution

EcoStruxure Automation Expert is Schneider Electric's software-centric universal automation system. The solution is designed to help logistics organizations address marketplace delivery speed challenges. By making it easier to deploy faster, more flexible conveyor, storage, and order preparation systems, logistics stakeholders will find themselves in a better position to compete.

At one international Schneider Electric distribution center, for example, EcoStruxure Automation Expert had been applied to auto-sorting lines. The facility has four input lines. In the past, if one of the lines experienced an electrical fault, all four lines would cease functioning, effectively shutting down the distribution center.

However, since the facility deployed EcoStruxure Automation Expert, an agile automation architecture with multiple controllers, design engineers could choose where to run the application. This approach increased system availability by eliminating single points of failure.

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EcoStruxure Automation Expert software presents advantages over traditional automation systems in several ways:

Time savings – A broader range of low-value manual tasks can be automated.

Improved uptime – Engineers are provided the tools they need to maximize asset uptime and optimize workforce efficiency.

Future proofing – Engineers can now develop applications that are future-proof. A wrap and reuse approach can be used to support current systems while allowing full application portability for future migrations.

Because software can now be decoupled from the hardware during project design phases when hardware infrastructures change due to multiple external factors, time is not wasted having to reprogram hardware to software interfaces. Even hardware changes in the late project design stages can be accommodated without negatively impacting overall time-to-market.

3-5x

Early estimates show that users of EcoStruxure Automation Expert are experiencing a 3 to 5x reduction in programming tasks.

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EcoStruxure Automation Expert was tested alongside three legacy automation offers from leading vendors. Independent external contractors with significant automation project experience were hired for engineering comparisons. Some of the key findings:

- **New project creation phase** – The asset-centric and object-oriented nature of EcoStruxure Automation Expert helped process engineers to design the new production processes faster and avoid tedious and error-prone work by automatically generating foundational code for the new application.

- **Engineering system diagnostics phase** – EcoStruxure Automation Expert also helped maintenance engineers to fix problems, minimize downtime, and drastically shorten time for root cause analysis.

- **Systems operation and agility phase** – In this phase, engineers were asked to change a controller from one unit to another and to assign a new controller to an asset. The hardware agnostic design of EcoStruxure Automation Expert enabled faster modifications.

3x These tasks were performed three times as fast using EcoStruxure Automation Expert.
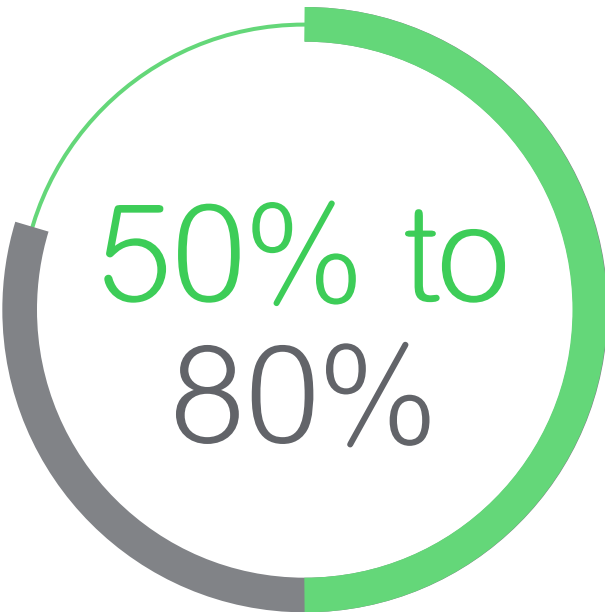
50% to 80% EcoStruxure Automation Expert demonstrated a 50% to 80% reduction in the time it took to perform diagnostics.
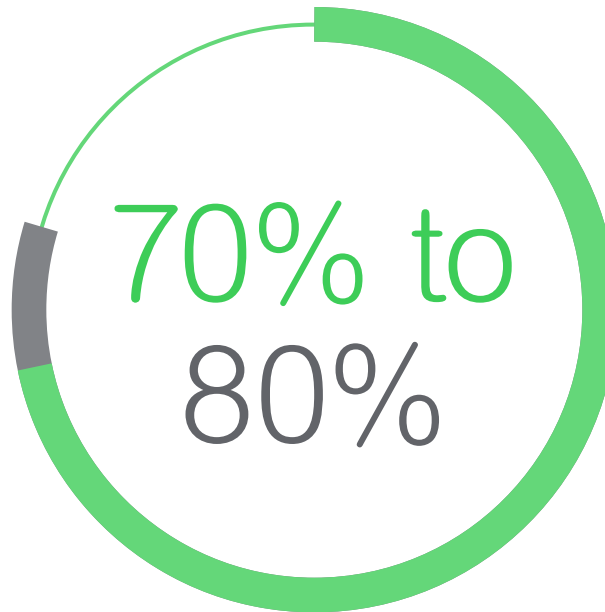
70% to 80% Changes were executed at a rate 70% to 80% faster with the open system.

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As an operator of dozens of global warehouses and distribution centers, Schneider Electric is uniquely suited to assist logistics firms that are seeking to modernize their operations through universal automation architectures.

In May 2020, Gartner ranked Schneider Electric #4 on its annual Supply Chain List of the Top 25 global supply chain leaders. A panel of more than 40 chief supply chain officers (CSCOs) and leading academics also selected Schneider Electric as the winner of the 2020 Power of the Profession Awards for its submission of "Smart Logistics" solutions. Schneider Electric won by redefining the meaning of "Smart Logistics" through a platform that delivers increased performance and customer visibility of the end-to-end customer fulfillment process.

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For those logistics organizations ready to undertake the journey to high-efficiency engineering automation project execution, several short-term and long-term steps can be taken:

Within the next month –
Identify initial areas within the enterprise where engineering costs are high and where project delivery times are extended. Begin to seek out vendors who offer systems that are easy to adopt and that allow for phased transition to process optimization.

Within the next 6 months –
Secure funding for those projects that represent low risk and high return. During this time, begin to assemble a team of interested internal stakeholders.

Within the next year –
Implement your first new engineering automation system pilot. Track expenses and quantify benefits during the pilot and test period. Leverage vendors to fill in knowledge gaps where required.

There are many distribution centers and warehouses operating today – and even under construction – that fail to optimize engineering and operational processes. New, disruptive digitized systems like EcoStruxure Automation Expert are now available at an affordable cost to address these issues.

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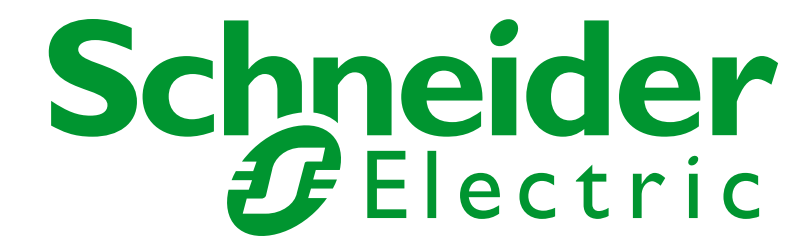
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