



F R O S T & S U L L I V A N

*50 Years of Growth, Innovation and Leadership*

## Podium Finish for Siemens AG:

Corroborated by the Research-Driven Competitive Advantage  
and Market Positioning (CAMP) Matrix for Machine Safety Markets

A Frost & Sullivan  
White Paper

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## OBJECTIVE

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This white paper portrays the key challenge themes and value trends that have been observed in the machine safety market. This white paper also introduces the reader to Frost & Sullivan’s proprietary CAMP (Competitive Advantage and Market Positioning) Matrix and elaborates on the unique positioning that Siemens AG (Siemens) has achieved by driving superior value for its customers. Finally, it provides a brief summary of the Siemens value proposition and key best practices that have enabled its customers to successfully meet present-day and emerging challenges.

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## INTRODUCTION

Machine safety products or solutions are those that ensure compliance to standard operating procedures while ensuring a safe working environment for the plant personnel, machinery, and the environment.

Historically, machine safety products were distinct units used to protect machine operators. The products were primarily used to safeguard components designed to allow a process to function safely. Traditionally, these systems were hardwired into a piece of machinery to meet a narrowly defined safety objective. With these types of systems, entire production lines had to be shutdown to conduct maintenance services on these components. As technology advanced, safety systems became more configurable and easy to program so that they could be easily maintained without hampering the equipment uptime, thus driving operational excellence. The key to achieving such attributes meant safety functions had to move beyond electrical and mechanical safety aspects of machines into functional safety. However, many of these types of safety systems still required separate controllers and networks to control and monitor safety and non-safety functions. The growing trend of incorporating safety as an integral function within the entire operating system has driven the need for safety technology that can more easily integrate into existing systems.

In the present day, state-of-the-art machine safety systems are integrated, meaning the controller and safety network architecture operate within a single central processing unit (CPU) to handle both control and monitoring of safety and non-safety functions. Within this market, programmable logic controllers (PLC)-based safety technology has become a rapidly growing key segment. This technology uses digital technology, thus reducing the need for hardwiring. However, in the future, safety relays will still represent the biggest market segment for safe evaluation. These features of modern integrated safety systems help end users to minimize the tradeoff between equipment uptime and operational safety.

Today, many industrial companies face two key challenges:

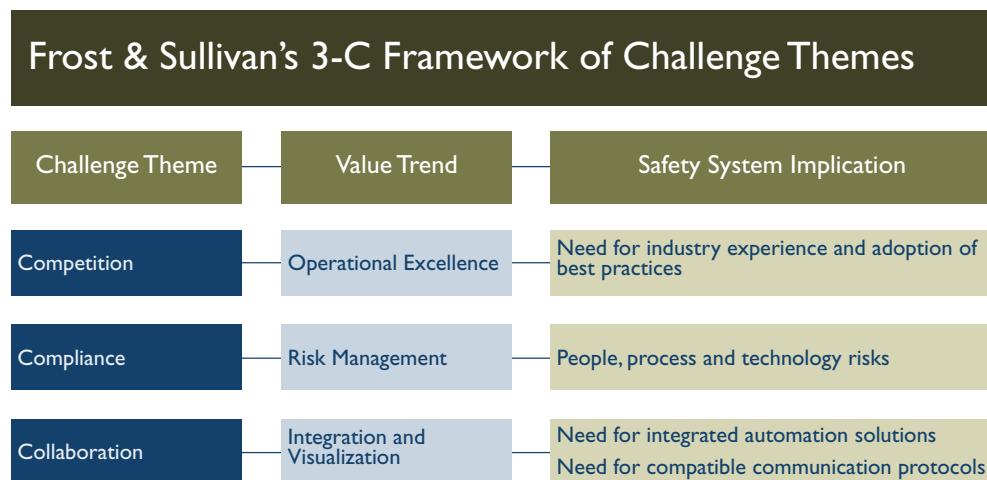
1. A dwindling skilled labor force with rising device complexity
2. The need to improve productivity without increasing long-term operational costs

To address these challenges, many companies are embracing the strategy of integrating all levels of their automation (safety, security, communication, diagnostics, and engineering). This approach provides companies with a competitive advantage in terms of process optimization, shorter production lifecycles, lowering manufacturing costs, and compliance to international safety standards. The key benefits to end users on implementing an integrated safety system are reduced unplanned downtime, increased overall equipment efficiency (OEE), return on investment (ROI), and reduced engineering costs.

## CHALLENGE THEMES IN THE INDUSTRIAL AUTOMATION AND PROCESS CONTROL SECTOR

Frost & Sullivan believes the 3-C framework clearly articulates the challenges faced by the process control and automation sector globally. Chart 1.1 shows these challenge themes, along with the value trends and implications. Value trends can be defined as the motivation factor behind overcoming a challenge theme.

**Chart 1.1**



Source: Frost & Sullivan

### **Competition**

In 2009, many discrete industry manufacturers faced a significant drop in demand. With the economy in slow recovery and capital expenditure funds still scarce, industries were looking at new ways to improve productivity without significantly increasing costs in order to maintain competitiveness. The effort to remain competitive in a globalized manufacturing landscape while struggling with a shrinking skilled labor force has driven end users to incorporate more automated systems into their operations. However, the challenge for manufacturers is to implement automation solutions while also finding ways to decrease, or at least maintain, their equipment’s total lifecycle costs. One of the other primary areas of concern for such manufacturers is the rising cost of production. While fixed costs are not easily controllable, end users are looking to stem the rising variable costs in order to reduce the risk exposure while protecting their profit margins. The key value trend (motivation to overcome the challenge theme) of competition is operational excellence.

### **Operational Excellence**

The need to do more with less is driving the mandate for improved asset effectiveness. This, in turn, is driving the trend for greater focus on operational excellence. In discrete industries, the ability to optimize processes reduces total cost of ownership. It also has an impact on manufacturing costs while decreasing the time

to market for new products, thus driving bottom-line profitability. Superior asset management strategies need to be in place in order to drive operational excellence for the enterprise. The diverse nature of an enterprise's assets requires distinct and prudent strategies that mitigate the trade-off between investments and rapid returns. The recent recession has also driven end users to squeeze the maximum possible performance from existing and newly inducted assets in order to drive return on investment and profitability. They also realize the importance of transitioning into predictive maintenance strategies in order to drive asset utilization rates.

### **Need for Industry Expertise**

Integrated safety systems provide manufacturers with the solutions they need to reduce unplanned downtime, improve productivity, and limit compliance risks. However, the machine safety systems market is a highly fragmented market, with a number of niche and geographic-specific solution providers. These make it difficult for manufacturers and machine builders to accurately assess which solution is the best fit for their requirements and to have an understanding of evolving technological advancements. It is vital that industrial users have an experienced partner on whom they can rely to understand current and emerging regulations and, subsequently, apply them to a specific working environment.

Additionally, while these companies need and want to acquire the best safety systems to match their needs, buyers need to justify the cost expenditure for these systems. Potential customers need to know what the lifecycle costs of the system will be as well as what type of technical support and services will be available to them over the course of that lifecycle. As investments are somewhat dependent on the cautious nature of end users, it is vital for solution providers to be in a position to meet the value-equation of the client. In relation to this customer need, industry and implementation experience is vital to be the most preferred supplier of choice. Customized service offerings, best-in-class product bundling strategies, and innovative application of next-generation technologies are expected to entice more customers to adopt integrated safety solutions.

### **Compliance**

Although incorporating safety strategies is a priority for manufacturers in the present day, it is also complicated due to the presence of diverse safety regulations throughout the world. The globalization of manufacturing has made it paramount for original equipment manufacturers (OEMs) to incorporate safety standards into their products that are not only globally accepted but are flexible enough to be integrated into existing systems. The flexibility of the safety system determines the ability to integrate with existing infrastructure, thus driving the value-to-cost proposition. This is particularly important to users who need to integrate machine safety systems into a plant with older equipment that does not meet current safety standards. Furthermore, in a marketplace where safety standards are constantly being evaluated and upgraded,

selecting an appropriate safety integrated level (SIL) designation is often a marked point of confusion for many users. Fortunately, harmonization of international safety standards, including the International IEC 61508 and the ISO 13849 in the European Union, has simplified this task. The best practice in handling compliance issues is to incorporate safety as an integrated aspect of a plant's operation—from machine design and worker training to predictive maintenance scheduling.

The key value trend of compliance is risk management.

### **Risk Management**

Best practices in machine safety risk management involve decreasing accidents, injuries, and equipment failures through implementing consistent constructive measures, respectively controlling and monitoring systems that prevent engineering design and operational deviations. The inherent risk factors associated with an organization include people, process, and technology risks.

### **People Risk**

A retiring skilled workforce means fewer people are available in-house with the knowledge and expertise necessary to understand occupational safety guidelines. The real or perceived lack of this technical knowledge often serves as an impediment to the adoption of integrated safety systems. Successful manufacturers and suppliers offer operational training and aftermarket support services, thus bridging the knowledge gap. In addition, PLC-based safety systems have easy-to-use human-machine interfaces (HMI) and simplified programming to accommodate production changes and needs. By automating safety functions with ease-of-use capabilities, companies are able to reduce workplace injuries and equipment failure due to operator error.

### **Process Risk**

Engineering design, safety compliance, maintenance and support, and downtime events are all challenges that must be addressed when a company evaluates its process risk. Failure of compliance is costly to a company, both in terms of money and reputation. The failure to adequately maintain and support equipment uptime can lead to unplanned downtime and possible injury to employees, as well as open the company up to litigation. Proper predictive maintenance planning and employee training can also help mitigate the possibility of unplanned downtime. In terms of mitigating process risk, integrated safety systems offer:

- Extensive diagnostic capabilities to identify problems before they cause expensive shutdowns
- Monitoring capabilities to allow for predictive maintenance scheduling

A properly implemented safety program, coupled with the latest safety technology, is a vital component of all risk management plans.

### **Technology Risk**

Technology adoption is paramount to continued success in a competitive marketplace. End users need to consistently update on emerging technologies to reap rich operational and profitable benefits. However, it is vital to partner with an organization, which has a deep understanding of market needs and potential developments. Non-intrusive nature is another critical need for implementation of new technologies. This will ensure reduced downtime of systems during the implementation phase. At a juncture, where investments are measured by its rate of returns, solution providers must be in a position to deliver a compelling business value proposition for end users across industry verticals.

### ***Collaboration and Integration and Visualization***

As OEMS and other industrial players move towards increased automation, it has become a significant challenge for users to integrate automated technology into existing systems. Users require an overarching open architecture in their automation technologies that will allow seamless interaction between all hardware and software, as well as provide enterprise-wide visibility into plant-floor processes. However, with the impending skilled labor shortage, diverse communication protocols, and limited capital available for new equipment purchase, users cannot afford to lose valuable time on extensive training or programming tasks.

### **Need for Integrated Automation Solutions**

End users' increased use of automated technologies brings with it a host of additional challenges, including assurance that the systems should be aligned to all process requirements while meeting international safety regulations. Therefore, solution providers must be able to offer safety solutions that can be integrated into standard automation systems (for example: PLCs, PC-based automation or drives) and can support transmission of safety-related data with compatible communications protocols that meet the required safety levels of reliability.

### **Need for Compatible Communication Protocols**

Using standardized communication protocols throughout all levels of an integrated safety automation system is vital for end users who use multiple vendors in their plant. By using standards such as PROFIBUS/PROFIsafe, users are able to speed up communication, hasten execution, and perform remote services while allowing standard and fail-safe data to transmit over the same line through bus cable and wireless mediums of communication.

## **FROST & SULLIVAN CAMP MATRIX**

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Frost & Sullivan has developed its proprietary Competitive Advantage and Market Positioning (CAMP) Matrix to help end users evaluate market positioning and technology selection partnership opportunities. The CAMP Matrix provides

a comprehensive snapshot of the whole market and uses a robust metric oriented approach to evaluate the position of safety systems companies for the purpose of this white paper.

The model is effective in providing a visual correlation with four quadrants, which can be customized to the client's requirements. The parameters for the quadrants are synthesized from specific objectives. The various ratings are tabulated based on primary as well as secondary research.

The CAMP Matrix is a visual representation of the marketplace for a specific time period. The model gives a snapshot of vendor performance in relation to that of their competitors and compares their strengths and capabilities.

The various ratings are tabulated based on primary as well as secondary research.

**Overall Company Revenue:** Market participants' overall revenues are consolidated and ratings are designated based on a scale of 1 (lowest) to 10 (highest). The rating is dependent on the prescribed methodology. Table 1.1 provides the scale for overall company revenues.

**Table 1.1: Scale for overall company revenues, 2010**

Overall Company Revenues, 2010 (\$ Million)	Rating
Less than 5.0	1
6 to 15	2
16 to 50	3
51 to 150	4
151 to 250	5
251 to 1000	6
1001 to 2000	7
2001 to 4000	8
4001 to 10000	9
More than 10000	10

**Product Portfolio:** Market participants are profiled and rated on a scale of 1 to 10 based on their presence across various industry verticals. Table 1.2 provides the scale for arriving at the product portfolio rating.



**Table 1.2: Scale for product portfolio rating, 2010**

Product Portfolio Rating	Product Portfolio Index
0 to 3.9	1
4 to 5.9	2
6 to 8.9	3
9 to 10.9	4
11 to 12.9	5
13 to 14.9	6
15 to 16.9	7
17 to 17.9	8
18.0 to 19.9	9
20	10

**Relative Market Share:** The company's market share in the machine safety market is calculated and decided based on the rating. This is calculated based on primary and secondary research.

**Table 1.3: Scale for relative market share, 2010**

Relative Market Share (in%)	Rating
0 to 1	1
1.1 to 5.9	2
6 to 8.9	3
9 to 11.9	4
12 to 14.9	5
15 to 17	6
17.1 to 19	7
19.1 to 21	8
21.1 to 25	9
More than 25	10

**CAMP Index:** The CAMP Index is a rating assigned to each participant based on the three key parameters for the chosen time frame. The index allows a base to be designed for the evaluation. For the purpose of this research, the CAMP Index is a weighted average of the three parameters: growth rate, geographic presence, and industry vertical presence. These parameters are defined below.

1) Growth rate of the organization: The safety systems market growth rate of the organization is considered during evaluation. The rating is dependent on methodology as described in the tabular column below, Table I.4.

**Table I.4: Scale for growth rate of the organization**

Growth Rate	Rating
0 to 2.9	1
3 to 3.9	2
4 to 4.9	3
5 to 5.9	4
6 to 6.9	5
7 to 7.9	6
8 to 8.9	7
9 to 9.9	8
> 10	10

- 2) Geographic presence: Individual weights are given for the geography based on its growth rates (NA—1.2, EMEA—2.3, APAC—4.5, ROW—2). The strength of the organization in the respective geographic domain is also designated (Strong—2, Moderate—1, Nominal—0.5). A final rating for each company is arrived at by multiplying the company strength in the geography with the weights given for each region. From this rating (refer to tabular column 1.5), a final index is arrived at for each company.

**Table 1.5: Scale for geographic presence of the organization**

Geographic Rating	Geographic Index
0 to 5.9	2
6 to 10.9	4
11 to 13.9	6
14 to 16.9	8
17 to 20	10

- 3) Industry vertical presence: A similar methodology to geographic presence is used here. Individual weights are given for each end user vertical based on its growth rates (automotive—0.5, food and beverages—2.1, packaging and material handling—3.5, OEM—2.2, electronics and semi-conductors—1.8, medical devices—2.8, press protection—2.0, others—2.0). From this compounded rating, table 1.6 shows the final end user index.

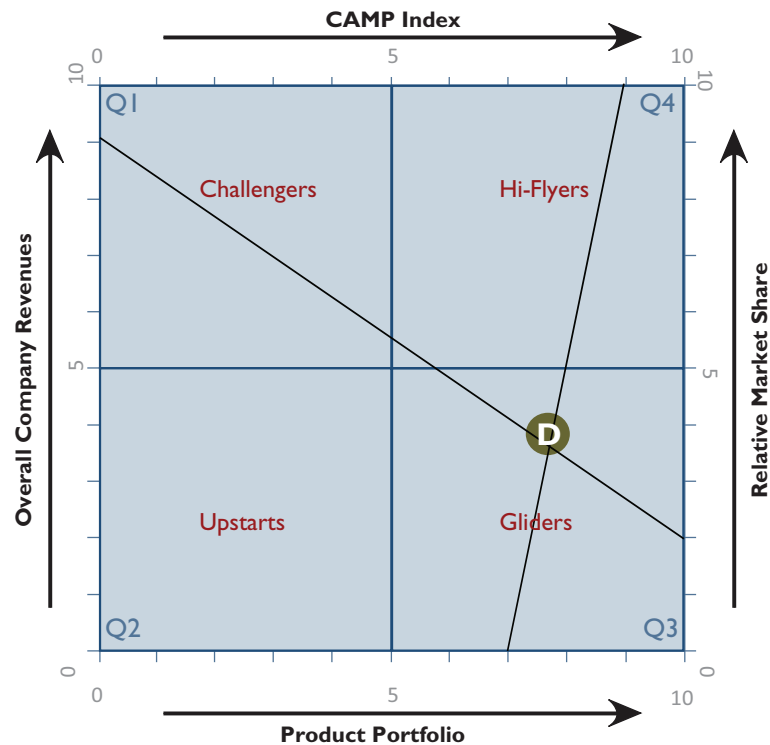
**Table 1.6: Scale for end-user presence of the organization**

End-User Vertical Rating	Rating
1 to 5.9	2
6 to 8.9	3
9 to 11.9	4
12 to 14.9	5
15 to 17.9	6
18 to 20.9	7
21 to 23.9	8
24 to 26.9	9
More than 27	10

The final CAMP Index is ultimately an average of the parameters mentioned above.

Chart 1.2 provides a snapshot of a sample CAMP Matrix and how a company's locations are determined based on the intersection of lines joining the axis on the opposite axis.

**Chart 1.2**



Intersection of the lines joining opposite axes determines the position of the company on the CAMP Matrix. The slope of the line is determined from the individual parameter rating given for each company. For example, If we take company (D), the overall company revenues rating is 9 and revenue from the industry vertical is 2. One axis is drawn based on the slope calculated from these two data points. Similarly, for the other axis, a CAMP Index rating of 9 with a product portfolio rating of 7 results in generation of the other axis. The intersection point of these two axes determines the position of each company on the CAMP Matrix. Similarly, all market participants' positions are profiled and plotted on the CAMP Matrix. Provided below is the significance of each quadrant on the CAMP Matrix.

**Challengers (Quadrant I):** In general, market participants present in this quadrant have registered consistent growth rates and have a loyal customer base in the industries they serve. Predominantly, the participants in this quadrant are niche

players. Participants in quadrant 1 are named “Challengers” as they challenge the “Hi-Flyers” in the area of the service they operate.

**Upstarts (Quadrant 2):** Predominantly, market participants in this quadrant have significantly less company revenues and a smaller presence across geographic segments (North America, Europe, Middle East and Africa, Asia Pacific, rest of the world). These participants are largely region centric, yet they have significant success among the end user verticals they serve. This quadrant is the major focus for probable acquisitions as companies in this quadrant generally have a strong value proposition and are likely to be stable and potentially high-growth companies in the future.

**Gliders (Quadrant 3):** Market participants in this quadrant predominantly have moderate revenues in the industry vertical while having significant geographic presence. These participants are usually present across different industry verticals; hence, they do not have dominance in any particular vertical. Participants in this quadrant are called “Gliders” as they have a relatively moderate market share in comparison to market leaders.

**Hi-Flyers (Quadrant 4):** This is the quadrant to which market participants aspire. Participants in this quadrant score high on all four parameters. They have a strong market position and may look for possible acquisitions to strengthen niche industry presence or extend geographic presence through acquisitions. Participants in this quadrant are called “Hi-Flyers” as they are strong in all parameters classified in this CAMP Matrix.

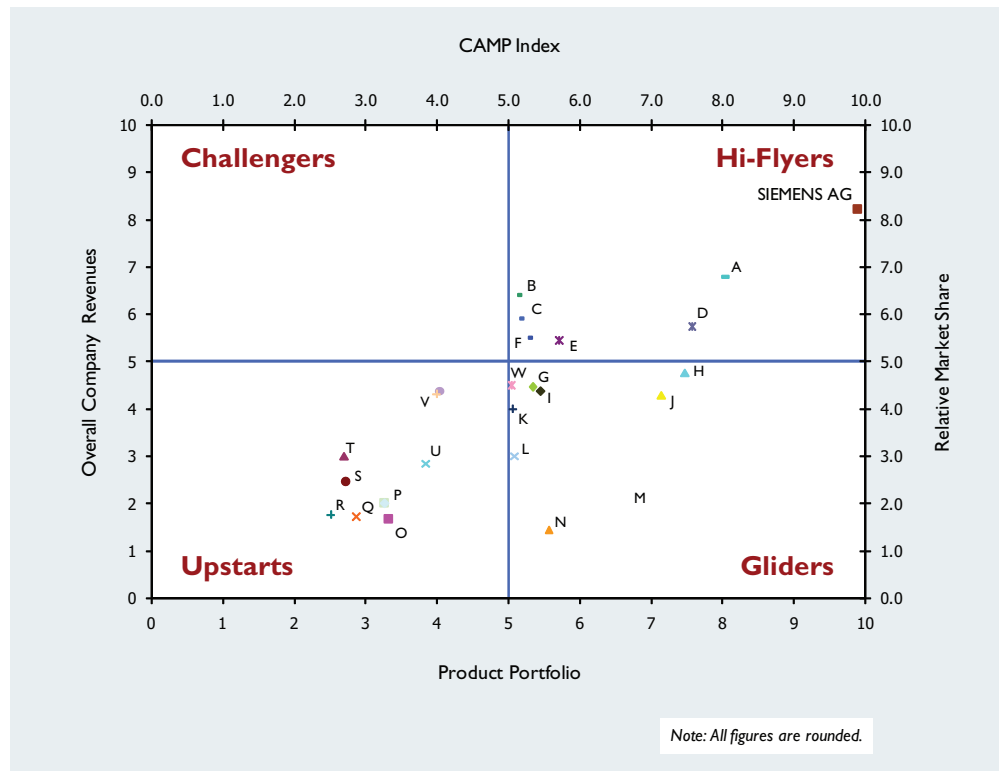
## CAMP MATRIX FOR MACHINE SAFETY SYSTEMS MARKET AND POSITIONING OF SIEMENS AG

As an outcome of the research on “Competitive Trends in the Safety Systems Market,” Frost & Sullivan’s analyst team covered both process and discrete/machine safety markets. The team researched global machine safety systems providers and identified key providers who could be potential partners for industrial end users who require these types of solutions. The CAMP Matrix analysis, provided for Siemens AG, is a research-driven recognition for Siemens’ ability to deliver superior customer value for the world machine safety systems markets.

Chart I.3 shows the CAMP Matrix for the global machine safety systems market.

It also benchmarks Siemens AG in comparison to various other market participants in discrete industries.

**Chart I.3: CAMP Matrix for Global Machine Safety Systems Market, 2010**



Source: Frost & Sullivan

Refer to N8F6 on [www.frost.com](http://www.frost.com) for full research.

As shown in the CAMP Matrix, Siemens is in the quadrant that represents “Hi-Flyers.” Such a competitive position clearly illustrates its dominance in the discrete/machine safety systems markets, especially in comparison to the other key market participants.

Siemens’ ratings for the respective CAMP Matrix metrics are shown below.




COMPANY	Product Portfolio Index	Overall Company Revenue	Relative Market Share	Growth Rate	Geographic Index	End-User Index	CAMP Index
<b>SIEMENS</b>	8	10	6	10	8	10	9

Source: Frost & Sullivan

Charts I.4 and I.5 show the competitive positioning of Siemens and its peers for various end user verticals and product line segments in the machine safety market.

**Chart I.4: Competitive Mapping of Solution Provider vs. End Users, 2010**

	Siemens	OmronSti	Rockwell Automation	Pilz	Schneider Electric	Schmersal	SICK
Auto	●	●	●	●	●	●	●
F & B	●	●	●	●	●	●	●
Pckg & Matl	●	●	●	●	●	●	●
OEM M/c	●	●	●	●	●	●	●
E & SC	●	●	●	●	●	●	●
Medical Devices	●	●	●	●	●	●	●
Press Prot	●	●	●	●	●	●	●
Others	●	●	●	●	●	●	●

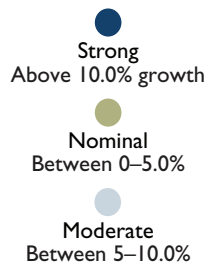
 Strong  
 Above 10.0% growth  
 Nominal  
 Between 0–5.0%  
 Moderate  
 Between 5–10.0%

**Key:**  
 Auto—Automotive, F&B—Food & Beverages, Pckg & Matl—Packaging and Material Handling, OEM M/c—Original equipment manufacturers of machine builders, Electronic & Semi-Conductor, Press Prot.—Press protection, Others—Water and wastewater, Metals & Mining, Aerospace & Defense

Source: Frost & Sullivan

**Chart I.5: Competitive Mapping of Solution Provider vs. Products, 2010**

	Siemens	OmronSti	Rockwell Automation	Pilz	Schneider Electric	Schmersal	SICK
Overall Market Strength	●	●	●	●	●	●	●
ESS	●	●	●	●	●	●	●
SIS	●	●	●	●	●	●	●
Safety Relays	●	●	●	●	●	●	●
Safety PLC	●	●	●	●	●	●	●
Others	●	●	●	●	●	●	●



**Key:**

- ESS—Electronic Safety Sensors
- SIS—Safety Interlock Switches
- Others—Safety Contactors, Machine Safeguarding Panels

Source: Frost & Sullivan

Siemens value-delivery proposition, customer-centric product development, and integration of sustainable features like energy efficiency within their product line have solidified Siemens AG's position as a trusted brand. The company has a medium to strong presence across geographies, and its dominance in the safety PLC market positions it as a formidable solution provider well into the future.



## SIEMENS AG—FULFILLING CUSTOMER NEEDS

The machine safety market's value chain includes functions that detect a deviation, validate the severity level, and then execute prompt and necessary actions. Siemens' broad portfolio of solutions addresses the entire value chain with product lines that offer flexibility to end users through the ability to be implemented in a standalone manner or as an integrated solution. Siemens capability to offer customized solutions for all safety requirements is well recognized and sought after by diverse end users in the machine safety markets. Safety Integrated from Siemens also provides superior benefits like faster and safer implementation. The primary product lines that incorporate Siemens' Safety Integrated are:

- **SIMATIC:** The SIMATIC controllers form the basis of Siemens' integrated automation system solutions. The SIMATIC product line with Safety Integrated consists of safety-related modular and PC-based controllers, I/O systems, engineering software, and other products for all areas of factory automation. This also includes industrial wireless products based on the industrial wireless network LAN (WLAN) for safety related purposes.
- **Safe Communication Protocols:** With integrated safety machines, communication standards increase in importance as it can be costly to users to install separate fail-safe communication avenues. To help solve this challenge, Siemens uses PROFI-safe, which is in line with IEC 61508 standards, thus enabling end users the flexibility to transmit standard and safety-related communication on a single bus cable. PROFI-safe uses PROFINET and PROFIBUS services to ensure a safe communication medium between devices and systems. PROFI-safe is also the best suited for application in the production and process industry.
- **SIRIUS:** This product line consists of safety components, including switching devices, safety monitors, safety locks, safety relays, modular configurable relays, emergency stops, and other machine safety components. These components can be either hardwired into a system with safety relays or, like Siemens' other solutions, connected via a network with AS-Interface (ASI) or ASIsafe communication technology.
- **SINAMICS:** This product line encompasses modular and scalable drive technologies with integrated safety functions according to IEC61800-5. The safety functions are initiated either through a failsafe onboard I/O or through PROFIBUS or PROFINET with PROFISAFE.
- **SINUMERIK:** A comprehensive and versatile portfolio of safety solutions for the machine tool industry. SINUMERIK supports all machining strategies along with extensive support across the entire machining process (from production plan to production process). The versatility of the solution is clearly visible from its ease of use in job shops and various complex machining processes.

SIMATIC controllers and I/O will work seamlessly with SIRIUS machine safety components, SINAMIC drive safety solutions, and wireless solutions to provide end users with the flexibility necessary to create a fully integrated safety system that is tailored to meet end user requirements. The solutions from these different product lines can be integrated into an existing standard automation system, enabling end users to reduce engineering and equipment costs as well as equipment footprint.

The scalability of the above solutions also allows for deployment at a machine level to plant level with open communications standards that support both standard and safety-related data. It also complies with the International IEC safety standards as well as various European Union (EU) and European Norm (EN) standards and regulations. Siemens' Totally Integrated Automation (TIA) architecture approach is designed to provide a single automation platform that allows all of its automation product lines to be integrated with one another to offer users complete flexibility in meeting their requirements. The company's TIA architecture is further advanced through its incorporation of standardized communication protocols to allow for communication throughout all levels of an enterprise.

Siemens' Safety Integrated automation solutions offer users the key benefits of increased regulatory compliance, reduced operational downtime, lower installation and maintenance costs, improved equipment availability, and reliability. The key characteristics above are enabled through fail-safe communication or encoderless safety drives that offer Siemens an unchallenged product line that judiciously combines both automation and safety.

### ***Managing Competition***

#### **Industry Expertise**

Siemens provides full lifecycle support for its integrated safety products—design and engineering, installation and commissioning, operation and maintenance, and modernization and upgrades. The company leverages its decades of expertise in safety technology to help users find the right system for their needs. Through its consulting services, Siemens assists clients during the planning stage to ensure the technology solutions being considered will meet the requirements and safety standards of the operation in question. The organization also provides operational training packages and 24/7 operational support once a solution is implemented, which helps end users reduce total lifecycle costs while improving overall equipment efficiency.

#### ***Managing Compliance***

Siemens' depth of experience in the machine safety systems market has enabled the company to develop a broad range of machine safety systems that range from safety integrated level (SIL) one through three, in addition to meeting other safety standards. For example, Siemens SIMATIC products are certified by TÜV (German Technical Inspectorate), ensuring compliance with the requirements of IEC 62061 (up to SIL 3) and EN ISO 13849-1 (up to PLe).

### People Risk

Unplanned downtime can often be associated with human error in either the engineering design or programming of a system or in the operation of the machine. Siemens' SIMATIC fail-safe systems are programmed with STEP 7 Safety, which is seamlessly integrated with the TIA portal, Siemens' new engineering platform. For program creation, design engineers or programmers can use a library of pre-assembled standard blocks, simplifying the task of programming complex functions. In addition, all configuration and programming tools are accessible through a single user interface.

The STEP 7 Safety ensures proper implementation of the safety program, which contains error detection functions and safety checks while the safety program is being run. By providing easy-to-use programming and operating solutions, Siemens helps end users reduce the risk of faulty safety programming and enhances a company's ability to reduce operational errors that can lead to costly shutdowns. Siemens' customer-centric approach is shown in its end user flexibility. A case in point: existing S7 Distributed Safety projects can be reused in STEP 7 Safety without changing any safety parameters.

### Process Risk

SIMATIC Safety Integrated systems incorporate fail-safe controllers and fail-safe I/O systems to create a single integrated automation system that is able to monitor all automation component functions and then communicate plant-wide diagnostic data by means of the PROFIsafe profile. Both standard and fail-safe communications can occur over a single line (bus cable or wireless). All of the SIMATIC solutions also contain internal diagnostic functions to ensure the product maintains a fail-safe state. Diagnostic displays are available any time from any place as a result of Siemens' integrated Web server for diagnostics. This means an end user can access diagnostic data for all automation components from any Web client with a standard Internet browser. This data visibility can hasten a user's decision-making abilities in the event of a fault, save valuable time when engaging in troubleshooting measures, and reduce unexpected downtime, which contributes to overall equipment efficiency. Siemens solutions are able to avoid expensive downtimes and high cost of re-launching systems after downtime by combining high availability and safety in one single system.

### Technology Risk

Siemens machine safety solutions are innovative and suitable for a majority of automation tasks. The organization's experience in the market has enabled it to develop integrated technologies that further enhance the value for end-users. A case in point is that of SIMATIC S7-300/-400 and WinAC RTX (F) controllers with an integrated PROFINET interface to deliver Web-based connectivity from anywhere with the communication protocol being industrial Ethernet. The level of commitment that Siemens is showing in the machine safety market and its ability to consistently stay ahead of the technology curve makes a compelling business case for diverse end users to partner with an organization like Siemens.

End users face the acute challenge of using a multitude of machine and plant equipment variants. The diverse nature of the solutions requires a single solution that can safely maintain these solutions along with a high level of energy efficiency. SINAMICS drives provide end users the possibility of realizing safe functions like Safety Limited speed without a safety encoder, which simplifies the design of new machines while driving extensive benefits to end users in the case of a retrofit. The onset of efficiency mandates across the world further solidifies the business case for end users in migrating from an older system to an energy efficient one without the concern of high downtime.

### ***Managing Collaboration***

#### **Totally Integrated Automation (TIA)**

Siemens introduced the term Totally Integrated Automation (TIA) architecture to describe its solution for providing a single automation platform that integrates diverse automation technologies across all industries and manufacturing plants. The objective of TIA is to integrate plant floor-level automation processes with manufacturing execution systems to enable enterprise-wide process data visibility and control. With its Safety Integrated product portfolio, Siemens has integrated fail-safe technology into its standard TIA architecture to facilitate risk mitigation and regulatory compliance within a single automation platform. Product solutions include encryption features, access protection, role-based availability, and private virtual networks to facilitate collaboration without compromising security.

In addition to the TIA architecture that forms the basis of Siemens' automation product solutions, Siemens offers the TIA Portal, which provides discrete end users with an engineering framework that contains all the automation software tools required to manage engineering software tasks such as controller programming, HMI design, or network configuration. This serves as an engineering project portfolio for the end user, allowing all design and programming of machine and process procedures to be completed in one place. Because of its easy-to-use interface and its ability to save previously programmed engineering blocks, the TIA portal can save users time in both training and programming.

To round out its portfolio of solutions that address collaboration within safety systems, Siemens also offers a wide range of SIMATIC HMI solutions for use in hardware and software. The open standards mean that the HMI can easily be integrated into existing automation systems. Furthermore, the HMI product suite can be applied at machine-level or in SCADA systems, offering end users a great deal of flexibility in terms of meeting their process visualization requirements.

## SIEMENS AG'S VALUE PROPOSITION—A CASE STUDY

The automotive industry is going through a drastic change in view of rising manufacturing costs and declining profitability. End users are actively looking at innovative solutions to cut back on costs and drive operational excellence while sustaining profitability. This industry has been a longtime user of automation and is currently leveraging the latest advancements in order to improve upon productivity and its associated benefits. Robotics is an area that continues to witness high levels of investment from this industry, primarily to deliver repeatable and reliable products at a fraction of a cost compared to traditional operational models.

The KUKA flexible production system is a well-known name in the industry. They implemented a body shop for a leading automobile manufacturer in North America. They wanted a reliable partner who could complement their extensive knowledge of the body shop. While there were many choices, KUKA Roboter GmbH (KUKA) chose Siemens primarily because of its industry experience, work quality, and its culture of consistent technology innovation.

The challenge faced by KUKA was to build the safety system for each cell involved in the automobile assembly operations in an optimized, simple, and flexible manner. The traditional model of safety systems would have increased costs due to hard fencing requirements and high costs towards panel construction. These rigid structures are highly inflexible and are not suitable for future modifications. KUKA wanted a solution that could bring both machine safety and control onto one field bus in order to deliver flexibility, lower costs, and increase operational agility.

Siemens Profibus-based system helped KUKA realize its vision by effectively executing machine functionalities and keeping operational safety in check. As diagnostics is very critical in such an operation, Siemens was able to deliver troubleshooting procedures for all critical I/O points. These were taken one level up into visual systems, such as HMI, to increase visibility across the operations. As flexible manufacturing principles continue to be adopted in the automotive industry, it is vital for support systems to be able to scale up or down without hampering production uptime and expenditure. The modular build of the solution and the common components used allowed KUKA to deliver a compelling value proposition for the automotive manufacturer. Moreover, the software coding was maintained as common between systems, which further enhanced the flexibility of change to KUKA. The benefits realized by KUKA were improved flexibility, extensive costs savings, and rapid scalability, which would not have been achieved with the traditional mode of hardwiring machine safety.

## CONCLUSION

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Siemens' safety solutions are not only designed to be an end-to-end automation solution, but one that is fully compatible with all of the components involved in an integrated automation system. This compatibility allows end users to upgrade to newer versions without the need for costly restructuring. The key value propositions that Siemens delivers through its TIA architecture are open communication standards, integrated safety controls, high system availability, and reliability.



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