Smart breakers, smarter power distribution

What can a circuit breaker do for you today that it could not do in the past? And why does that matter?

The answer to those two questions is the key to delivering on smarter power distribution solutions today that

- Collect real-time actionable data that enables quick and accurate protection decisions.
- Reduce risk of electrical accidents.
- Automate key protection decisions using advanced built-in configuration and programming functions.
- Simplify solutions to save customers money.
- Deliver the communications required in today's connected world.
- Give you informed/proactive control over your energy consumption.
- Allow you to manage assets proactively to help protect against costly unplanned outages.

Circuit breakers in the past have provided basic power protection, some measurement capabilities, and a minimal ability to connect. Today's smart electronic circuit breakers and electronic trip units, like those represented in ABB's SACE® Tmax XT and Emax 2 breakers, represent a distinct shift in how you might deploy and manage smarter power distribution solutions.

A fundamental shift in the role of circuit breakers

What is the big difference in this technology shift? Electronic breakers have evolved to be smarter (and this evolution will continue). Manufacturing capabilities and materials are allowing more and more features, functions, and data storage to be directly embedded into the smart circuit breaker itself. These features are software driven, are more configurable, and deliver more data to you. As the breaker has always been at the heart of protecting your distribution network, today's next generation smart breakers provide the embedded intelligence to become the brains – the knowledge center – for your smart power distribution solution.

It may sound like an oxymoron to say that smart technology offering advanced features can simplify solutions, but that is exactly the benefit ABB smart breakers deliver. Technology should serve business to deliver innovations, like smart power distribution, which simplify work and help increase efficiency, savings, productivity, and reliability, while lowering cost of ownership. This paper will examine specifically how ABB's next-generation breaker technology creates new value in terms of smarter power distribution solutions.

Circuit breakers with the ability to make decisions

Today's smart breakers offer a robust suite of built-in functions that move far beyond basic circuit protection to use real-time data and events to help make decisions that automate smart power management protections required to keep your business running. Breakers can now collect actionable data and utilize rules and alerts that you configure to manage your power distribution solution as your needs grow more complex. For example, the advanced features now available on ABB's smart circuit breaker trip units allow you to:

- Get immediate actionable data using power quality, voltage and frequency measurement and alarms.
- Gather and proactively review asset health information using I/O and temperature monitoring for power distribution equipment and connected assets.
- Make the workplace safer through direct access to electronic trip units via HMI panel (one for multiple breakers) or Bluetooth®* connection for mobile devices that allow you to access breaker settings from outside the arc flash boundary.
- Monitoring power distribution data from the cloud – anytime, anywhere, on any device.

Smart breakers are creating more value by simplifying your ability to create the functions and reporting you need with less equipment, fewer manufacturers, and lower related to installation and maintenance labor costs.

Circuit breakers with the ability to take action

Another immediate benefit that today's advanced breaker technology provides customers is that these new smart breaker functions replace the traditional add-on equipment costs required in your electrical network. As more functions are offered on the breaker, you can eliminate additional physical devices (meters, PLCs, etc.) and connections required to provide those functions. You eliminate the boxes, the wiring, and the labor to install and maintain them – eliminating cost, complexity, and potential failure points – thus simplifying your network requirements.

Today's smart breakers provide the configuration and programming functions to:

- Customize protection using programmable embedded functions to handle load shedding, microgrid applications and automatic transfer switching
- Manage complex conditional protection schemes using adaptive protections that enables altering protection scheme settings automatically based on events

Figure 1 provides a quick overview of the feature packages available (packaging together more than 50 individual built-in or field upgradable functions) for the various Ekip™ Touch electronic trip units available. These packages frequently fit specific industries and can be added and modified (as you need them for specific applications). Figure 2 provides a quick overview of how these smart power packages

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Figure 1

Default functionalities and upgradability of the trip units:

	Standard Protection	Standard Measures	Measuring Package	Voltage Protections	Frequency Protections	Power Protections	Adaptive Protections	Adaptive Protections	Network Analyzer	Advanced Voltage Protections	ROCOF Protections	Power Controller
Ekip Touch	●	●	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
Ekip Touch Measuring	●	●	●	↑	↑	↑	↑	↑	↑	↑	↑	↑
Ekip G Touch	●	●	●	↑	↑	↑	↑	●	↑	↑	↑	↑
Ekip M Touch	●	●	●	●	●	↑	●	↑	↑	↑	↑	↑
Ekip Hi-Touch	●	●	●	●	●	↑	●	●	●	↑	↑	↑
Ekip G Hi-Touch	●	●	●	●	●	●	●	●	●	●	●	↑

● Available by default

↑ Upgradable

↑ Some functions available. Upgradable with the full package.

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Figure 2

Suggested packages by segment:

Packages	Wind	Solar	Data Center	Building Infrastructure	GenSet	Mining	Marine	Industries	Utilities
Voltage Protections	●	●		●	●		●		
Advanced Voltage Protections	●	●			●				
Frequency Protections	●	●			●	●		●	●
Power Protections			●	●		●		●	●
ROCOF Protections	●	●			●				
Adaptive Protections	●	●		●		●			
Measuring Package	●	●	●	●	●	●	●	●	●
Data Logger	●	●	●	●	●		●	●	
Network Analyzer	●	●	●	●	●	●	●		●
Power Controller			●	●		●			●

might work together for some of the more common industry applications.

The bottom line is that smart breakers are creating more value by making it simpler for you to create the functions to further improve and automate power protection with less equipment, fewer manufacturers, and lower installation and maintenance labor costs.

Circuit breakers with the ability to communicate

One notable breaker function advancement that stands out in today's connected world is the ability to communicate. Today's smart breakers not only communicate with each other, but also offer more direct communications with assets throughout your network to measure and collect data, take actions, and deliver both insights and alerts to you as needed. Smart breakers provide a wide variety of plug-in communication options (ABB smart breakers offers 10+ communication protocols) that further simplify your smart power solution by delivering the tightly integrated communications capabilities that you need, without all the extra equipment, time and money.

You can now combine the power of this communication with the kinds of features and functions discussed above to connect to evolving digital solutions that help analyze data and act on data to help improve power efficiency and uptime – and, you can access this data from anywhere, anytime, and on any device.

Circuit breakers with Ability

Two visible points of measurement and potential benefit, when it comes to the performance of your power distribution solution, are uptime (risk) and effectively managing energy usage (costs). The increased number of embedded functions, particularly for measuring, monitoring, and event notifications all contribute to enabling a new way of addressing both of these top issues.

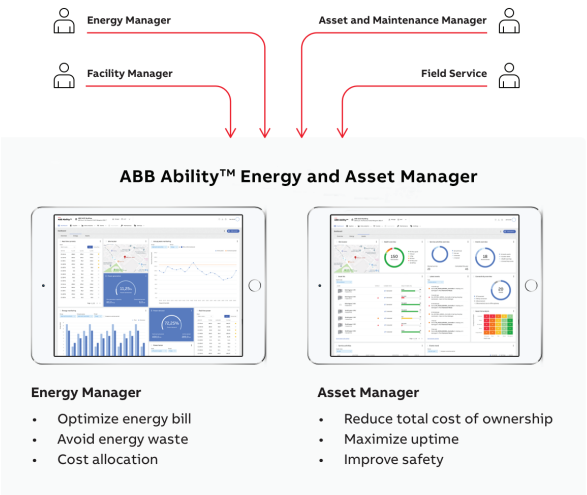
For energy management, embedded measurement functions generate data that you can retrieve to evaluate the amount of power delivered in order to track energy consumption, plan for best energy usage (non-peak pricing), and more fully utilize the equipment you own. Of course, you can gather this information by physically conducting equipment readings but the good news is smart breakers can provide you this information anytime and anywhere (if you choose).

Just combine ABB smart breakers with ABB Ability™ Energy and Asset Manager, and you have 24/7 access to energy usage and power quality graphs and details for a single site or multiple sites. You can even retrofit older equipment to be included in this connected solution with the use of ABB Ekip Up. Real time analysis of valuable data from field devices enables you to closely monitor the performance of multiple installations with a single supervision system. The clear information available about consumption and improvement opportunities helps make cutting waste and improving energy efficiency simple. In other words, helps save real money by proactively managing energy usage.

The second potential benefit is “uptime.” For electrical systems that protect critical loads, critical processes, critical business services, critical community services and certainly critical lifesaving activities, the health and function of your electrical systems and network represents a premium risk mitigation and prevention investment. The advancement of the smart circuit breaker helps contribute to your ability to address this challenge both in terms of monitoring asset health and to move you from a physical-based “go check every breaker and review measurements” to a predictive asset health model. A predictive maintenance approach puts you in charge of when scheduling downtime for service, vs. being in a reactive mode, thus, further helping avoid costly unplanned outages.

For example, using ABB Ability Asset Manager, you can monitor power consumption trends on motors or even temperatures of power contacts to quickly identify changes in power patterns or temperature warnings that may indicate that a motor is starting to fail. You can set up alerts based on custom parameters that notify maintenance when events occur and schedule a predictive maintenance intervention to help prevent an unplanned outage due to a failed motor.

This is a significant shift in managing power and assets. You can transform from viewing maintenance history or published fail rates to create plans for regularly scheduled preventative maintenance to a more proactive and less intrusive predictive maintenance approach. You can transform from viewing power consumption history to create plans to save on energy or improve efficiency to a near real-time view that allows you to be more proactive in finding savings, helping protect against unplanned expenses, and getting the maximum use of existing equipment.



Transforming to smart power distribution management

When you are ready to transform to smart power distribution, today’s smarter breakers deliver the function and data that will facilitate that move. These modern breakers along with easy-to-use cloud-based or mobile software, deliver the features to get there, including:

- Plug and play communications protocols.
- Pay-as-you-go advanced features/functions.
- Accurate and insightful data collection.
- Insights delivered anywhere, anytime, to any device.

Whether you are powering a data center, a hospital, a factory or any “always on” power distribution environment, the new capabilities of smart breakers in smart power distribution environments give you the much-needed ability to simplify your power distribution solution and help: save money, maximize uptime, manage energy efficiently, and be proactive in protecting your operations and profits against electrical failures.

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