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SIMOCODE for Ethernet/IP

Extending intelligence into new environments

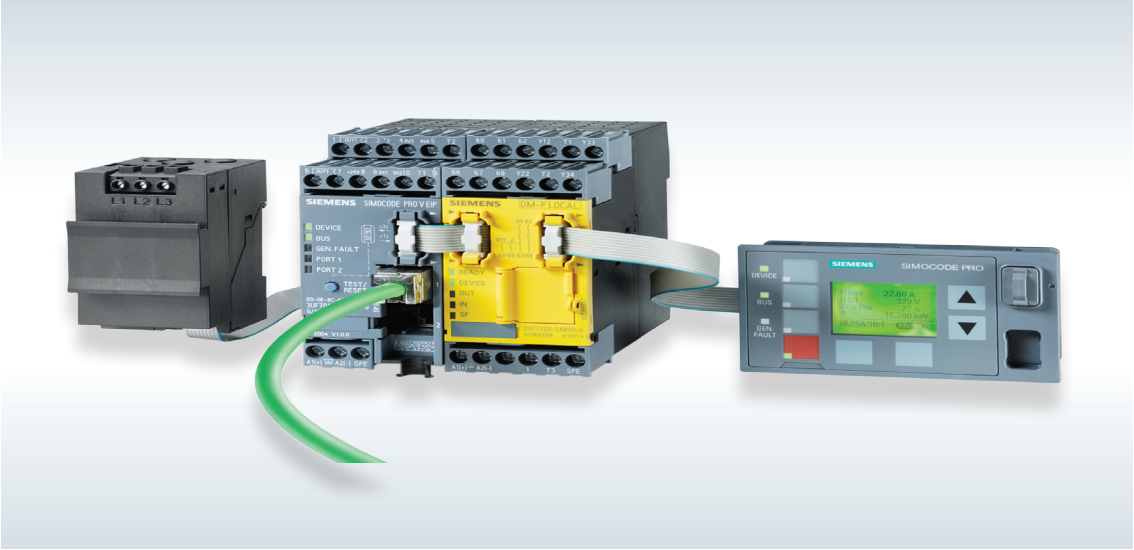
With an increased range of communication protocols, solid-state overload relays can be retrofitted for a broader range of motor control centers in more operating environments.

While conventional motor starters are typically reserved for applications where a high degree of sophistication is not needed, new measuring and communication technologies added to the overloads can extend integration to these simpler devices. For instance, the ability to measure power consumption while monitoring equipment operations can save maintenance time, optimize energy use, and reduce costs of production.

This new approach is used in motor control applications where a conventional starter or motor control center (MCC) provides a full-voltage, across-the-line starting action. In these installations, an overload mechanism is inserted between the main contactor relay and the motor itself. During an overcurrent event, the overload will trip and protect the motor. Traditional overloads use a thermal mechanism, but in recent years electronic versions are becoming more common.

Thinking about the individual elements of a complete motor and starter installation, the overload is in a very strategic place between the main contactor relay and the motor itself. From this vantage point, much can be seen with regard to what is happening with the motor. If a positive indication is needed that the motor is running, what better way is there than quantifying the current passing through the overload? It's a simple matter to verify all three phases are present, and if the contacts become welded shut on the main relay, it will be visible at the overload.

Looking at the motor's operating characteristics, much can be inferred about the equipment it is powering. For example, if the normal operating current draw of the motor increases by 10% over the course of a week, it may still be within its normal range, but the change itself indicates something is possibly going wrong with the motor, or something has happened with the process causing it to work harder. In the case of a motor-driven pump, has there been a change in the flow rate or some other parameter to account for the difference? If not, it's time for maintenance to start looking for deteriorating bearings or some other mechanical cause.



Intelligent overload

To increase the functional capabilities of overloads, Siemens designed the SIMOCODE product family. There are five operating ranges, from 0.3 to 3 amps all the way to 63 to 630 amps, so the practical motor-handling capability covers everything from fractionals to about 500 hp. All the units are solid-state and can be configured to trip on current, or current and voltage.

Siemens uses the strategic location of the overload to its greatest advantage in the design of its SIMOCODE solid-state overload relay, which has two main functions: First, to perform the basic interruption role in the case of an incident, but then also to measure both the current and voltage passing through the overload relay. This approach uses a modular design, with the measuring and electronic elements separated into two sections connected by a ribbon cable. When used this way, the solid-state overload relay has the capability to measure and record effectively every operating variable of the motor.

Intelligence allows the unit to go even further, turning simple measurement functions into monitoring. Siemens SIMOCODE can be configured and programmed to act on the measurements it sees using basic logic functions so it can respond to specific situations.

For instance, SIMOCODE controls power consumption not only by measuring the value but also by comparing the consumption to a set point and turning off the system if the measured value goes above or below the set point. In addition to measuring current, voltage and power, SIMOCODE also monitors 4 to 20mA analog input signals and temperature.

Since isolated information has no value, SIMOCODE has the ability to communicate to a controller, such as a PLC or larger automation system, using PROFIBUS, PROFINET or Modbus RTU. The most recent version of the product now extends the selection to EtherNet/IP, vastly extending the number of applications in which it can be used.

Designed for retrofits

While SIMOCODE was originally used in conjunction with Siemens starters and MCCs, given all these additional capabilities it's no wonder users quickly began retrofitting them to existing applications from a variety of manufacturers. Replacing dumb overloads is often the easiest and least expensive way to add smart capabilities to an old MCC. SIMOCODE's modular design makes this particularly easy, saving cost and time instead of replacing the entire MCC.

Siemens SIMOCODE can perform many smart functions in isolation without communication to any other type of controller, but the greatest benefits come from sending information to PLCs or other automation systems. When working in environments where most of the equipment is from Siemens, the use of PROFIBUS and PROFINET covers most of the requirements. In many other areas, Modbus RTU can do the job. But in North America, there are many locations where Rockwell is a major supplier and EtherNet/IP is the primary communication protocol.

To help assist these users, Siemens has now released SIMOCODE Pro for EtherNet/IP. It is designed specifically to work in Rockwell environments where CompactLogix PLCs run RS5000 software communicating via EtherNet/IP. Rockwell has its own E300 smart overload family, but many users have shown a preference for SIMOCODE, hence this new product development.

The practice of mixing vendors in situations like this is not new and is very common. A PLC from one company routinely communicates with a VFD from another, but the ease with which they can be blended depends on the manufacturer's intentionality to make such adaptations uncomplicated.

Web server to deliver diagnostics

One of the restraints keeping many companies from fully using diagnostic information from intelligent overloads is the complexity of extracting the data. In traditional environments, simply seeing the data on an HMI involves a huge amount of programming and overhead to go into the overload, extract

the desired information and display it. It adds to the tag count for the HMI and requires a variety of new screens.

SIMOCODE solves this problem by incorporating a web server in each unit, preconfigured to display all the available information using a library of faceplates. All of this is available without any additional configuration or code writing. By simply accessing the IP address of the unit, all of this information can be displayed automatically, using a simple menu-based system. This can be done using the existing HMI simply by adding a button on the screen and programming it to access the IP address. All the diagnostic information, monitored variables and historical data come up automatically with no additional programming or screen designs."

Working in a Rockwell environment

As mentioned, the SIMOCODE Pro for EtherNet/IP is designed to bring this sophistication and functionality to environments where PLCs, such as CompactLogix, or process controllers, such as PlantPAX, run operations, and basic communication is via EtherNet/IP. These systems use RS5000 as their programming platform, so any non-native equipment has to be imported.

Rockwell's smart overload product family is the E300, but many users prefer the capabilities of SIMOCODE even if it means going through the necessary steps to help it work in a different environment. Siemens has worked extensively to make the translation as easy as possible for users wanting to bridge the cross-platform gap.

When installing a non-native piece of equipment, a user has to work in two environments to complete the configuration and get the device operating in the new system. In this specific case, SIMOCODE has to be configured using Siemens TIA Portal and then brought into the RS5000 system. Once this is done, it is possible to treat SIMOCODE as if it is native to the RS5000 environment, completing the configuration and enabling all functions within the RS5000 environment.

Reviewing all the steps to get to that point is not practical in this paper, however in general terms it is simple for the RS5000 system to recognize SIMOCODE; its EDS needs to be installed in the RS5000 database. Siemens provides the EDS file, and the importing mechanism is relatively simple. Configuring SIMOCODE requires use of Siemens TIA portal, and this is often the first exposure a Rockwell user has to this different programming environment.

Most users who work daily with RS5000 will find the TIA Portal a highly intuitive structure that is easy to grasp with little experience. If a user's sole interest is installing more than one SIMOCODE on a CompactLogix platform, it is simple to create the basic template for one and then use the library function to store the various permutations. This minimizes the amount of configuration necessary as new devices are added.

In some complex environments, it may be useful to add a Siemens HMI to the CompactLogix platform for the purpose of communicating with SIMOCODE in parallel with the CompactLogix. Some users find it easier to use Siemens native tools and communication methods to work with SIMOCODE for configuration while the normal data flow goes to the CompactLogix system.

If working in a process manufacturing environment, Rockwell's PlantPAX and Siemens PCS7 platform use very similar mechanisms for faceplates. It is a simple matter to move the SIMOCODE faceplate into PlantPAX.

Suffice it to say, Siemens has designed the installation process to be as simple as possible for a user wanting to use SIMOCODE in a plant where Rockwell is the default supplier. It is necessary to dig into the TIA Portal to help with the process, but most users find this far easier than expected once they begin. Naturally, users tend to prefer the engineering platforms they know best, but the TIA Portal is intuitive enough that users who only engage with it occasionally, find it comes back quickly.

Applying intelligence

Users who go to the trouble of importing SIMOCODE into a Rockwell environment do it because they want the functionality. While many smart overloads perform basic measuring, SIMOCODE moves into more sophisticated monitoring. It has the capability to examine the information it is gathering and perform critical functions much like a small PLC. SIMOCODE can be outfitted with its own I/O, allowing discrete and analog sensors to be added, such as temperature and vibration sensors to monitor the motor's bearings and overall health.

It can even be used to perform basic process functions such as turning a pump on or off based on information from a tank level gauge. Transferring simple functions like these to the SIMOCODE make it unnecessary to have the larger controller handle them, and it maintains the functionality even if the host system goes down. In the pump control example, having the local ability to stop the pump before it runs the tank dry and damages itself could be very critical in the event of a problem.

More creative use of these functions can solve some troublesome challenges, as in the following example. Given the low temperatures typical of winters in Canadian oil fields, starting a motor when it's -40° can be a challenge. The inrush current in such a situation is much higher and lasts longer than usual, but given the temperature of the windings, there is very little chance that the motor will be damaged. Nonetheless, conventional overloads tend to trip before the motor gets going. Installing SIMOCODE allows the user to program a routine to read a temperature sensor to determine how cold the motor is, and effectively turn off the overload function long enough to bring the motor up to speed. Once everything is running, it returns to normal operation conditions. This is the kind of functionality that brings users to SIMOCODE, making the cross-platform installation well worth the effort.

This ability to monitor and protect the process connected to the motor, in addition to the motor itself, is what sets SIMOCODE apart from conventional and even many intelligent electronic overload relays. The complete package of capabilities and ease-of-use is a key driver as users in all vendor environments work toward digital plants and smarter manufacturing.

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