Process and Power Control

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Rockwell Automation
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1. The Value Proposition

2. Ethernet/IP as the enabler
Rockwell Automation defines Intelligent Motor Control as a reference architecture for the integration of motor control devices to your plant-wide control system.

**Intelligent Motor Control leverages your investment in automation to provide continuous optimization in:**

- **Energy**
  - Reduce energy consumption
  - Track performance
  - Energy management

- **Availability**
  - Reduce downtime
  - Reinstall systems faster
  - Avoid system disruption

- **Engineering**
  - Reduce development time
  - Reduce commissioning time
  - Common user experience

- **Safety**
  - Protect personnel
  - Protect assets
Intelligent Motor Control

Simultaneous real-time control, configuration and data acquisition
... Integrated Architecture is our differentiator
Intelligent Motor Control

Intelligent devices with energy saving features combined with the overall communication capabilities of the Integrated Architecture enable an energy management strategy to bring you both an immediate and measurable impact on your operational efficiency

- **Energy Savings**
- **Energy Management**
Energy

Efficiency = Savings
Motors typically consume over 60% of the energy in an industrial facility.

Reduce Energy Consumption & Demand Peaks

- Significant energy by driving variable torque loads at the speed required by the application.
- Reduce the inrush current and extend the life of electric motors associated with critical rotating assets.
Energy

- Reducing the speed of a variable torque application by only 20% can save up to 50% in energy consumption.

- Reduction of energy consumption through adoption of variable speed control.

Key driver for the replacement of control valves
• Reduce inrush currents (peak demand charges) and excessive starting torque

• A 50% reduction in voltage results in a 75% reduction in motor torque
Energy

- Variable frequency drives
  - Reduce wear on motors from excessive starting torque
  - Reduce energy consumption by running motors at the needed speed
- Reduced voltage starters
  - Significantly reduce inrush currents that result in peak demand charges
  - Reduce wear on motors from excessive starting torque

Efficiency translates to savings — motors typically consume over 60% of a plant’s energy
Energy Management

Easily retrieve information from Intelligent Motor Control devices about the energy consumed by each motor in the system—without impact on the control function.

- Easily retrieve information on energy consumption of devices
- Monitor your key assets—electric consumption, torque signature and relevant process variables to assess and track asset performance
- Make informed decisions along the lifecycle of your assets
Energy Management

Power consumption is reported across the network

Information can be easily retrieved—without impact on the control function
Asset Performance

Monitor information from Process Control instrumentation.

By correlating energy consumption and operational data it is possible to track the performance of mechanical equipment in the plant.
With Intelligent Motor Control devices you can drive strategies to improve overall plant availability

- Reduce Unplanned Downtime
- Avoid System Disruption
- Reinstate systems faster
Availability

In resource based industries, production downtime directly impacts the top line.

\[
\text{Downtime} = \text{Lost revenue}
\]
Availability

Diagnostic data from intelligent motor control devices can trigger either manual or automatic intervention before occurrence of unplanned shutdown.

Predictive diagnostics

- Electric motor current indicating loading conditions.
- Vibration signature indicating mechanical unbalance.
- Torque signature indicating Process anomalies.
Scalable offer to match Asset size and relevance

**E1 +**
- Thermal Overload
- Phase Loss
  - Enhanced sensing
- Ground Fault
- Jam detection
- Thermistor monitoring

**E3 +**
- Thermal overload
- Phase loss
  - Adjustable delay
- Ground Fault
- Jam detection
- Stall detection
- Hours of operation
- Underload detection
- Current imbalance

**825**
- Thermal overload
- Phase loss
  - Imbalance sensing
- Phase reversal
- Ground fault
- Jam detection
- Stall detection
- Hours of operation
- Underload detection
- Current imbalance
- Short circuit protection
- RTD monitoring

**857**
- Motor & Feeder
- Thermal overload
- Phase loss
  - Imbalance sensing
- Phase reversal
- Ground fault
- Jam detection
- Stall detection
- Hours of operation
- Underload detection
- Current imbalance
- Short circuit protection
- RTD monitoring
- Power Factor
- Arc Protection
Availability

Reduce time to troubleshoot and repair with immediate access to diagnostic information on any device in the system from any location.

- Full access to information in each motor control device from any location in the system.
- No dependency of information previously “mapped” to control system.
Availability

Certified Safety devices help personnel to safely perform maintenance work without bringing equipment to full stop.

Avoid complete shutdown and restarting sequence.
With Intelligent Motor Control, you can reduce the time required to configure and commission your system—all while using a common platform and Engineering toolset.

- Reduce Development Time
- Reduce Commissioning Time
- Common User Experience
Engineering

Shorter time to develop application code and configure devices across the system, while reducing risks associated with human error.

- Develop application code independent of electrical layout
- Data in motor control devices automatically mapped in controller memory.
- Reuse data structures, application code and graphical objects
Develop application code independent of electrical layout and list of variables

Reuse data structures, application code, and graphical objects
Get your systems up and running faster by commissioning and configuring your devices using a common software tool.

**Reduce commissioning time**

- Engineering tools and libraries to speed deployment and maintenance
- Eliminate I/O mismatch errors
- Motor Control Centers wired, configured and tested from factory
- Reduction of Project risk
Engineering

Reduce commissioning time

- Motor Control Centers wired, configured and tested from factory
  - Reduce installation and set-up time
- Use one software tool to configure your entire Logix system
  - Device parameters mapped in controller memory
  - Eliminate I/O mismatch errors
Consistent operation across the product families to help reduce training and labor costs

- Integrated profiles and instruction set for motor control devices
- No logic or tables to move data in the system
- Single software tool to program controllers and configure motor control devices
- Field device integration, with Ethernet as the backbone
Common user experience

- Single software tool to program controllers and configure motor control devices
  - Significant reduction of learning curve
  - More efficient maintenance
  - Integrated profiles and instruction set for drives
The Intelligent Motor Control portfolio is designed to deliver improved safety – resulting in greater productivity, cost-saving advantages and, most importantly, protection for personnel and assets

- Protect Personnel
- Protect Assets
Safety

Minimize operator exposure and help protect from electrical and mechanical hazards

Remote access to devices from any point within the system
Design and construction features to minimize operation risk.
Minimize operator exposure by monitoring remotely

<table>
<thead>
<tr>
<th>Diagnostic</th>
<th>IntelliCENTER</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overload detection (monitor warning/trip)</td>
<td>Door Closed</td>
<td>Status shown on Elevation View</td>
</tr>
<tr>
<td>Change overload relay setting (FLA and Trip Class)</td>
<td>Door Closed</td>
<td>Via Parameters in Monitor View</td>
</tr>
<tr>
<td>Measure/monitor phase currents</td>
<td>Door Closed</td>
<td>Trend or Meter in Monitor View</td>
</tr>
<tr>
<td>Measure baseline motor current</td>
<td>Door Closed</td>
<td>Trend and Save Data</td>
</tr>
<tr>
<td>Ground fault detection (monitor warning/trip)</td>
<td>Door Closed</td>
<td>Elevation or Monitor View</td>
</tr>
<tr>
<td>Monitor motor thermistor</td>
<td>Door Closed</td>
<td>Trend or Meter in Monitor View</td>
</tr>
<tr>
<td>Time to trip, Time to reset</td>
<td>Door Closed</td>
<td>Trend or Meter in Monitor View</td>
</tr>
<tr>
<td>Reset overload relay</td>
<td>Door Closed</td>
<td>Monitor View</td>
</tr>
<tr>
<td>Event history</td>
<td>Door Closed</td>
<td>Event Log View</td>
</tr>
<tr>
<td>Verify control power</td>
<td>Door Closed</td>
<td>Monitor View</td>
</tr>
<tr>
<td>Verify starter operation</td>
<td>Door Closed</td>
<td>Monitor or Elevation View</td>
</tr>
<tr>
<td>Unit documentation</td>
<td>Door Closed</td>
<td>Documentation View</td>
</tr>
<tr>
<td>Component identification</td>
<td>Door Closed</td>
<td>Monitor View / Spares / Manuals</td>
</tr>
</tbody>
</table>

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Maintenance managers need to reduce personnel exposure to the energized electrical equipment

- **Center placement of bus**
  - Horizontal bus is not accessible for maintenance personnel to accidentally contact
  - Horizontal bus is separate from where you need to run conduit

- **Automatic Shutters**
  - Provide you immediate isolation when unit is removed from column

- **Form 4b Isolation and Separation**
  - Keep live load terminals isolated, while performing periodic maintenance on other units
SecureConnect - Reduce Electrical Shock and Exposure to Harmful Voltages

- Connect and Disconnect unit stabs without opening the enclosure door or being in the arc flash boundary (no exposure to live electrical parts)
- Enhanced compliance with NFPA70E Section 110.3 for your Electrical Safety Program
The Plant Safety Officer needs to reduce the potential exposure of all plant personnel to arc flash hazards.

- Fundamental design of CENTERLINE 2500 MCCs minimizes the likelihood of an arc flash occurring:
  - Continually-braced bus
  - Automatic shutters
  - Arc-free zones
  - Standard PE in all columns, making first connection when unit is inserted and disconnects last

- CENTERLINE 2500 MCCs with ArcShield:
  - Helps protect your personnel if an arc flash were to occur within an MCC
  - Provides personnel and assembly protection

1 Per IEC/TR 61641:2008 for arcing durations up to 300 ms; available for systems at 415V (max), with 65kA (max) available current.
Intelligent Motor Control helps you implement a single solution plant-wide that supports continuous improvement.
1. The Value Proposition

2. Ethernet /IP as the enabler
Communication technology

Access to information throughout the enterprise

*Ethernet/IP*
- One Network
- One Network Technology
- No Tables and / or Logic to move data

No Data routing limitations
- One name / address for data
- Logical Segmentation per designer’s choice
- Topology options
EtherNet/IP - Standard Protocol Model

Application Layer

TCP

UDP

IP

CSMA/CD

Physical Layer

IEEE 802.3

File Transfer
Email
Web
Voice/Video
Servers
Management
EtherNet/IP

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Mix Business, Industrial, and Commercial Technologies to Solve Applications – Plant-wide
Access from I/O Location - Master/Slave

- Separate networks
  - Supervision & Programming
  - I/O Control
- I/O devices (slaves) can only communicate with Controller (master).
Access from I/O Location - Master/Slave

Access to system wide information requires extension of Supervision network to remote I/O location.
Access from I/O Location - Ethernet /IP

- I/O, Control and Visualization devices on the same network
- Immediate access from any point to the entire system
- Only one network needs to be installed
Remote Monitoring - Master/Slave

- Full access to controller memory
- Access to device information previously "mapped" to Master (controllers).
- No remote access directly to "slave" devices
• Full access to any device in the system
• Communication with devices concurrent with Control application
Devices configured at each individual master-slave link

Device parameters organized in data tables

- Tables and / or logic to move data
- Programmer needs to identify each parameter in data table
- Devices configured from single location in the system
- Device parameters automatically “mapped” into controller memory
- No tables and / or logic to move data
  - Parameters immediately identifiable to Programmer
- Automatic Device Configuration
Take away

Ethernet/IP + Logix + IMC Devices
Continuous improvement strategies throughout the plant lifecycle.

- Life Cycle Costs of mechanical assets are a key parameter in the evaluation of a new project.
- Single network and software model provide more value than traditional systems.
- Ethernet/IP, simultaneous control, configuration and information management.