HEAVY INDUSTRY SOLUTIONS





SEL

40+ YEARS OF INNOVATION

6,500+ EMPLOYEES WORLDWIDE

100% EMPLOYEE-OWNED

170+ COUNTRIES WITH SEL SOLUTIONS AND SERVICES

100+ OFFICES WORLDWIDE



WE ARE SEL

Schweitzer Engineering Laboratories (SEL) is a trusted provider of complete power protection, automation, communications, and metering solutions for critical industries and utilities worldwide. From oil refineries in deserts to the world's largest water and wastewater facilities, critical operations around the world rely on SEL solutions because they are designed and tested to operate reliably in the harshest environments. And we back that reliability with a ten-year, no-questions-asked warranty.

If you face smaller engineering staffs and increasingly complex regulatory requirements, SEL can help. SEL engineers are industry experts with experience in distribution protection and control, industrial power system management, distributed energy resource integration, and cybersecurity best practices. They can help you meet your operational needs with the following solutions and services.

SOLUTIONS

Protection Systems and Metering

- Feeder protection
- Motor protection
- Arc-flash mitigation
- Generator protection
- Transformer protection
- Special protection schemes
- Power quality and revenue metering

Automation Controllers and Computing

- Real-time automation controllers
- Communications processors
- Programmable automation controllers
- Pump automation controllers
- Industrial computers (compact and rack-mount)

Communications and Cybersecurity

- WAN and LAN networking (wired and wireless)
- Transceivers and adapters
- Cybersecurity

SERVICES

- Power protection and automation (settings, scheme design, communications architecture design and programming, fault and coordination studies, and documentation)
- Arc-flash hazard mitigation
- POWERMAX® Power Management and Control Systems
- Microgrid controls
- MOTORMAX® smart motor control for low-voltage systems
- Model power system testing (hardware-in-the-loop)
- Operation communications and networking solutions
- Cybersecurity
- Coordination studies
- Commissioning services



NORTH AMERICAN ELECTRIC UTILITIES CHOSE SEL AS THE BEST-IN-CLASS RELAY MANUFACTURER IN THESE CATEGORIES*

TECHNOLOGY (84%)

SERVICE & SUPPORT (87%)

PRICE (82%)

*NEWTON-EVANS RESEARCH COMPANY SURVEY: "*WORLDWIDE STUDY OF THE PROTECTIVE RELAY MARKETPLACE IN ELECTRIC UTILITIES: 2019–2022 VOLUME 1—NORTH AMERICAN MARKET*"

WHY OUR CUSTOMERS CHOOSE SEL



▲ SEL-751 FEEDER PROTECTION RELAY

Low cost of ownership. SEL devices have the highest mean time between failures (MTBF) in the market (over 500 years), come with no-charge configuration software, and are backed with our ten-year worldwide warranty.

No-charge technical support by experienced local engineers.

Reliable solutions designed, built, and tested for trouble-free operation in extreme conditions and temperatures from –40° to +85°C (–40° to +185°F). SEL devices are UL-listed and CSA-certified.

Scalable solutions that allow industrial facilities to grow their systems from basic protection to advanced ultra-fast power management.

Flexible, secure, and robust system solutions.

Advanced diagnostics and reporting capabilities for improved situational awareness, efficient troubleshooting, asset utilization, and early warning of system instability.

Seamless integration into existing systems. Flexible communications ports and protocols allow custom configuration of applications with serial, Ethernet, Modbus, IEC 61850, Mirrored Bits®, DNP3, and IEEE C37.118-2011 communications.

Rapid commissioning, testing, and post-fault diagnostics with Sequential Events Recorder (SER) reports and oscillographic event reports. Built-in metering functions eliminate separately mounted metering devices.

WE SERVE THE OIL, GAS, AND PETROCHEMICAL INDUSTRIES



Upstream, midstream, downstream, onshore, and offshore, innovative SEL solutions protect, automate, and control power systems. From platforms in the Gulf of Mexico and refineries in the deserts of Saudi Arabia to chemical plants in the United States and liquified natural gas (LNG) plants in Australia, operations around the world choose SEL for innovative products, superior-quality solutions, and exceptional customer service.

"SEL industrial-grade computers are awesome! The units run flawlessly day in and day out—nice, cool, and quiet! I run the [Honeywell] modular system business for the Americas and use SEL computers for our oil and gas demo systems. **NOT ONE TIME HAVE I HAD AN ISSUE** with either the rack-mount or flush-mount version! To be quite honest, your units have made my demo dreams a reality."

DAVID GALVAN
CHANNEL BUSINESS MANAGER
HONEYWELL

100% OF THE TOP GLOBAL OIL AND GAS PRODUCERS RELY ON SEL

92% OF THE TOP U.S. REFINERIES

70% OF THE TOP MIDDLE EASTERN OIL REFINERS



▲ SAUDI ARAMCO

▶ **CUSTOMER**
Saudi Aramco

PROJECT
Shaybah Gas-Oil Separation Plant (GOSP) Expansion, Saudi Arabia

SOLUTION
Complete Power Management

Located in the remote Rub' al Khali desert, this contingency-based system performs load shedding in 12 milliseconds, providing power system reliability and availability.

CUSTOMER
Chevron

PROJECT
Gorgon Natural Gas, Australia

SOLUTION
Complete Power Management

An SEL complete power management solution supports the Chevron Gorgon facility (one of the largest natural gas projects in the world) on Barrow Island, about 37 miles (60 km) off the northwest coast of Australia.

CUSTOMER
Tengizchevroil (TCO)

PROJECT
Tengiz Oil Field, Kazakhstan

SOLUTION
Complete Power Management

SEL technology provides integrated protection, monitoring, and control systems for the world's deepest oil field. The system maximizes process uptime, protects personnel, and provides reliable electricity to TCO.

WE ARE DEEP INTO METALS AND MINING



Our power management, process control, and automation solutions are designed for the extreme environmental conditions common in mining and metal-forming industries. SEL products monitor and protect valuable equipment and ensure an uninterrupted supply of electric power in every corner of a site or facility.

"I use SEL not just because of their industry-leading products and technical support…but because **SEL AND ITS PEOPLE ARE COMMITTED TO DOING THE JOB RIGHT** and making the user happy with the end product."

TIM BURTTRAM
PLANT ELECTRICAL ENGINEER & SENIOR PROJECT MANAGER
CASCADE STEEL ROLLING MILLS

85% OF TOP GLOBAL MINING FIRMS RELY ON SEL

100% OF THE TOP GLOBAL COPPER FIRMS

80% OF THE TOP GLOBAL ALUMINUM FIRMS

70% OF THE TOP GLOBAL STEEL FIRMS

LARGEST COAL MINE IN THE WORLD



▲ CITIC PACIFIC MINING

▶ **CUSTOMER**
CITIC Pacific Mining

PROJECT
Pilbara Sino Iron Magnetite Mine, Australia

SOLUTION
Power Protection and Automation Solutions

The CITIC Pacific Mining magnetite mine uses an SEL power protection and automation solution for their high- and medium-voltage power systems.

CUSTOMER
Ma'aden Phospate

PROJECT
Umm Wu'al Facility, Saudi Arabia

SOLUTION
SCADA and Power Management and Control System

The SEL subcycle load-shedding solution protects against power blackouts for the Umm Wu'al plant. This facility is the world's largest fully integrated fertilizer production operation, with 3 million metric tons of annual production.

CUSTOMER
Global Mining Firm

PROJECT
Large Copper Mining Project, Peru

SOLUTION
POWERMAX Power Management Solution

SEL solutions protect the power system at one of the world's largest, open-pit copper and molybdenum mines.

WE KNOW PULP AND PAPER



SEL power system, communications, and automation solutions are ideally suited for pulp and paper plants, especially those with cogeneration assets. By integrating process and power control systems, our products are more efficient than those found in typical single-purpose control networks.

"SEL field technical support has been very valuable to me. During our upgrade project, I got fast and reliable technical answers. And **THAT'S SIMPLY HOW GOOD SEL SUPPORT IS.** I know we can count on SEL for that level of support every time."

DON ELLIOTT
SENIOR ENGINEER/POWER MANAGER
RESOLUTE FOREST PRODUCTS

80% OF THE TOP NORTH AMERICAN PULP AND PAPER PRODUCERS RELY ON SEL



▲ INTERNATIONAL PAPER

CUSTOMER
International Paper

PROJECT
Georgetown Paper Mill, South Carolina, USA

SOLUTION
Microgrid

SEL designed and implemented a microgrid power management system for International Paper, enabling them to grid-connect or island their power system by shedding excess load.

CUSTOMER
Georgia Pacific

PROJECT
Savannah River Paper Mill, Georgia, USA

SOLUTION
Power System Protection and Load-Shedding Technology

The Georgia Pacific Savannah River Paper Mill runs 24/7, helped by SEL power system protection and load-shedding technology.

CUSTOMER
Verso

PROJECT
Quinnesec Paper Mill, Michigan, USA

SOLUTION
Arc-Flash Mitigation

SEL provided Verso a complete arc-flash mitigation solution with labeled wire harnesses to simplify installation. In addition, SEL Engineering Services provided engineering design, settings, updated drawings, and commissioning.

WE PROTECT WATER AND WASTEWATER OPERATIONS



SEL provides innovative, advanced asset protection and power management solutions for complex water and wastewater applications around the world. Our power protection solutions substantially improve plant uptime by proactively detecting electrical system anomalies before damage occurs. SEL protects feeders from catastrophic arc-flash events, and we extend the life of pump and blower motors by employing thermal models that reduce equipment stress.

"We have found that **IT IS FAR CHEAPER TO RIP OUT ALL OF THE CONTROL WIRING IN OLD PANELS AND INSTALL THE SEL-849 THAN IT IS TO PERFORM A SINGLE PANEL MAINTENANCE.** Added features, like improved motor life, safety, remote monitoring, network interface, operation log, we are essentially getting for free."

CLYDE McMORROW
RETIRED WATER UTILITY ENGINEER

LARGEST WATER PLANTS IN THE WORLD RELY ON SEL

- FILTRATION (CHICAGO, ILLINOIS, USA)
- DESALINATION (SAUDI ARABIA)
- WASTEWATER (CHICAGO, ILLINOIS, USA)



▲ JUBAIL WATER AND POWER COMPANY

CUSTOMER

Jubail Water and Power Company

PROJECT

Al Jubail Desalination Plant, Saudi Arabia

SOLUTION

Power Protection and Industrial Communication

Al Jubail, the world's largest desalination plant, provides drinking water for six million residents in Riyadh, Saudi Arabia. Their system relies on SEL for power protection and communications.

CUSTOMER

Imperial Irrigation District

PROJECT

All-American Canal, California, USA

SOLUTION

Power System Automation and Communication

SEL provides SCADA, cybersecurity, and HMI services for eight hydroelectric power plants located along the All-American Canal. This 80-mile (130 km) aqueduct is the largest in the world.

CUSTOMER

Florida Keys Aqueduct Authority (FKAA)

PROJECT

Florida Keys Water Transmission, Florida, USA

SOLUTION

Energy Metering

FKAA is saving $600,000 (USD) per year in electrical costs by using the data provided by SEL meters. The SEL accurate power metering solution helps FKAA operators make real-time process decisions that optimize energy usage.





AUTOMATION CONTROLLERS AND COMPUTING



COMMUNICATIONS AND CYBERSECURITY

SEL HAS PROVEN POWER SYSTEM SOLUTIONS

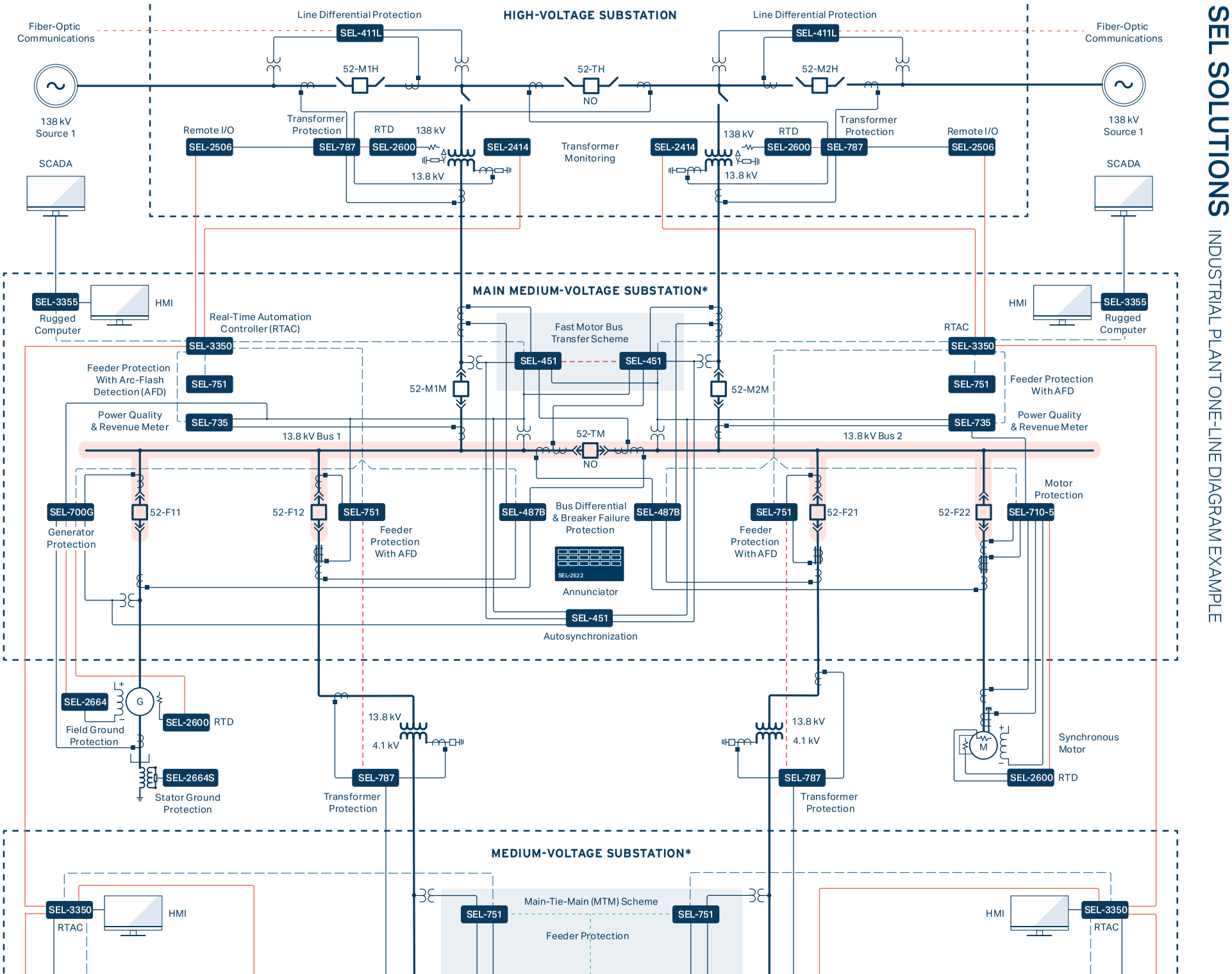
SEL invents, designs, manufactures, and supports a complete line of products for the protection, monitoring, control, automation, and metering of electric power systems. Our products meet the rigorous environmental and operational demands of facilities that must operate flawlessly 24 hours a day, 7 days a week. We are committed to our quality with a worldwide, ten-year, no-questions-asked warranty and unmatched, free technical support and customer service.

FOR A DETAILED LIST OF OUR PRODUCTS AND SOLUTIONS, VISIT SELINC.COM/SOLUTIONS.

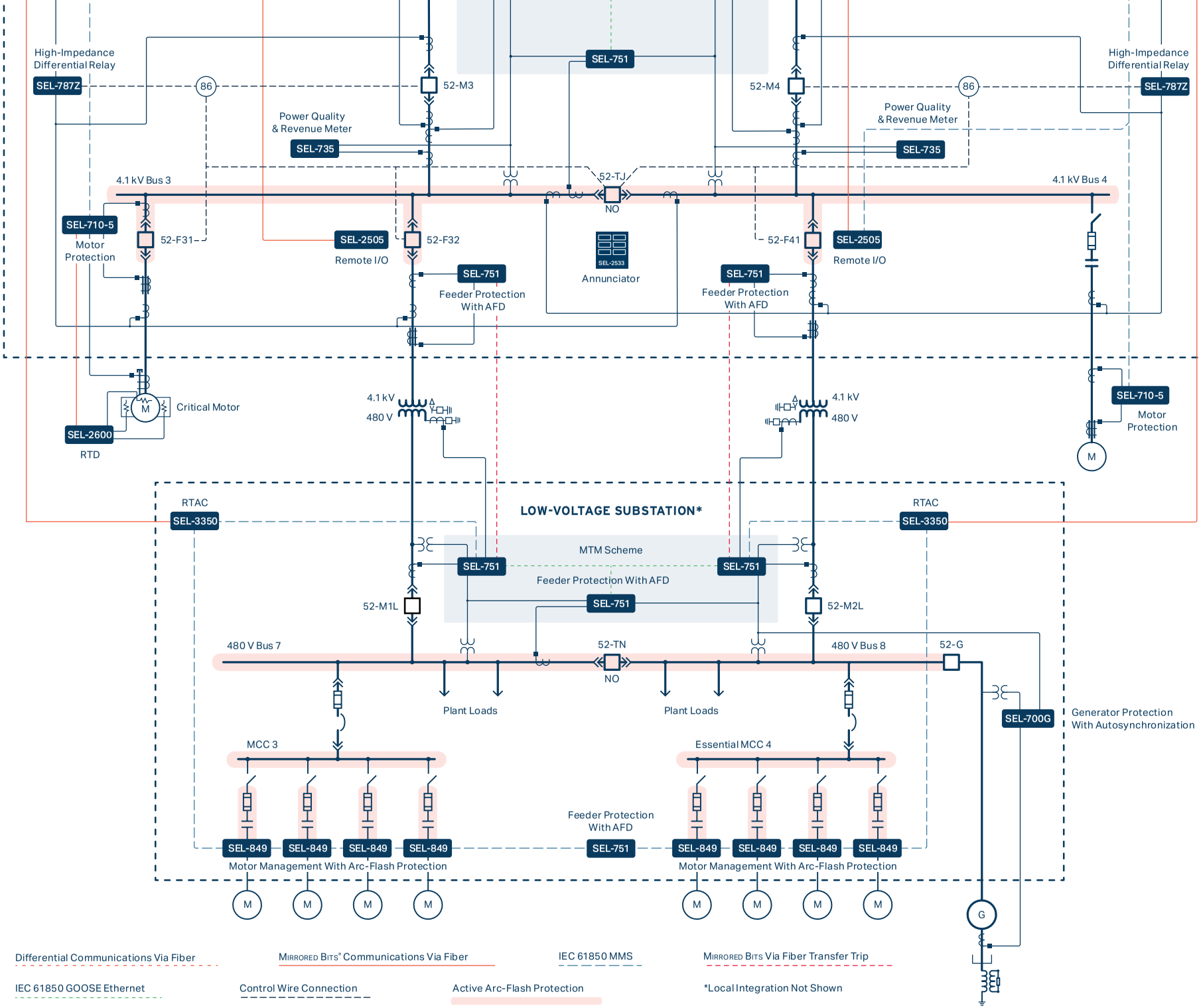


PROTECTION SYSTEMS AND METERING

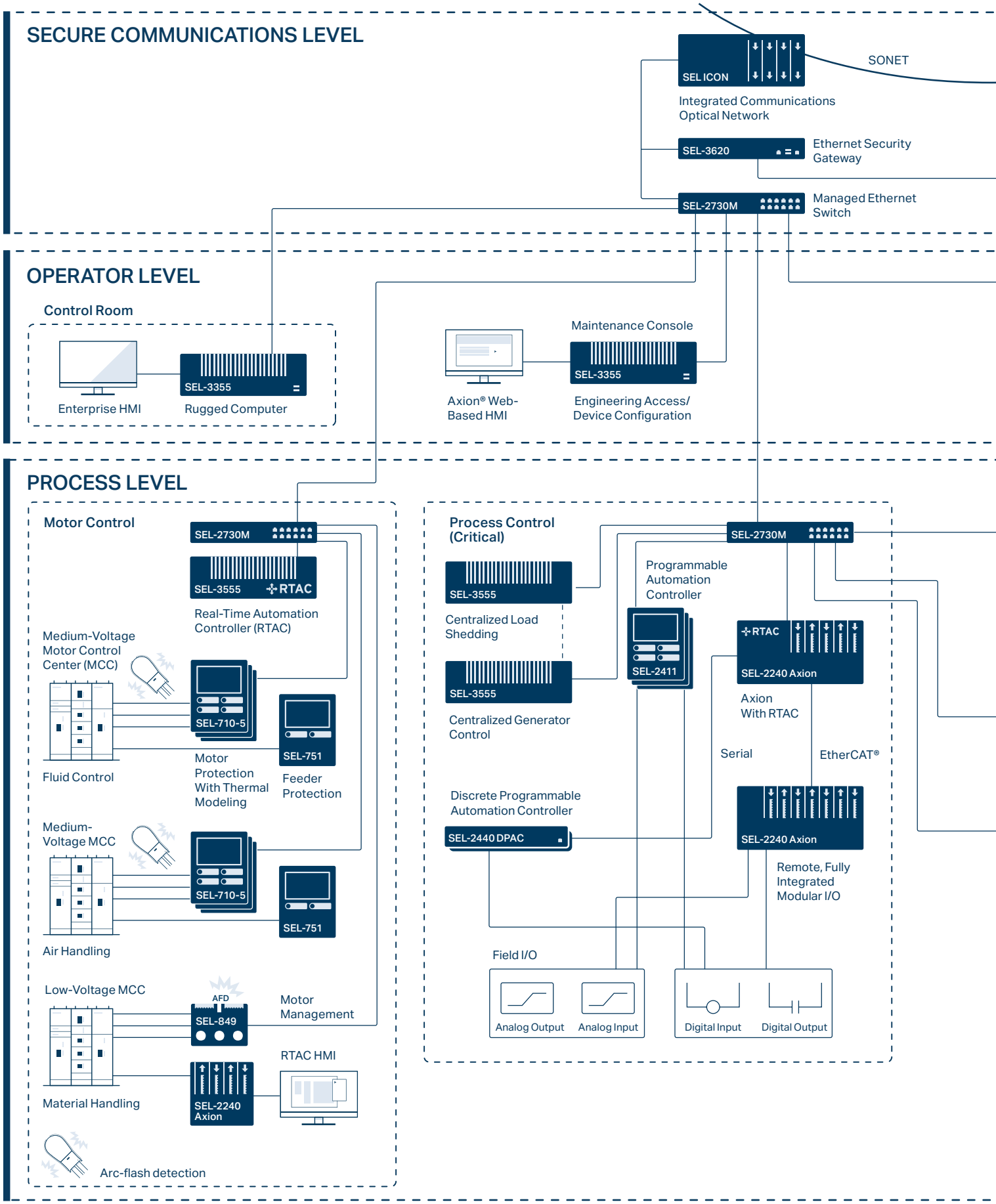
▶ READ ON TO LEARN ABOUT TYPICAL APPLICATIONS OF SEL PRODUCTS AND SOLUTIONS AT INDUSTRIAL SITES.

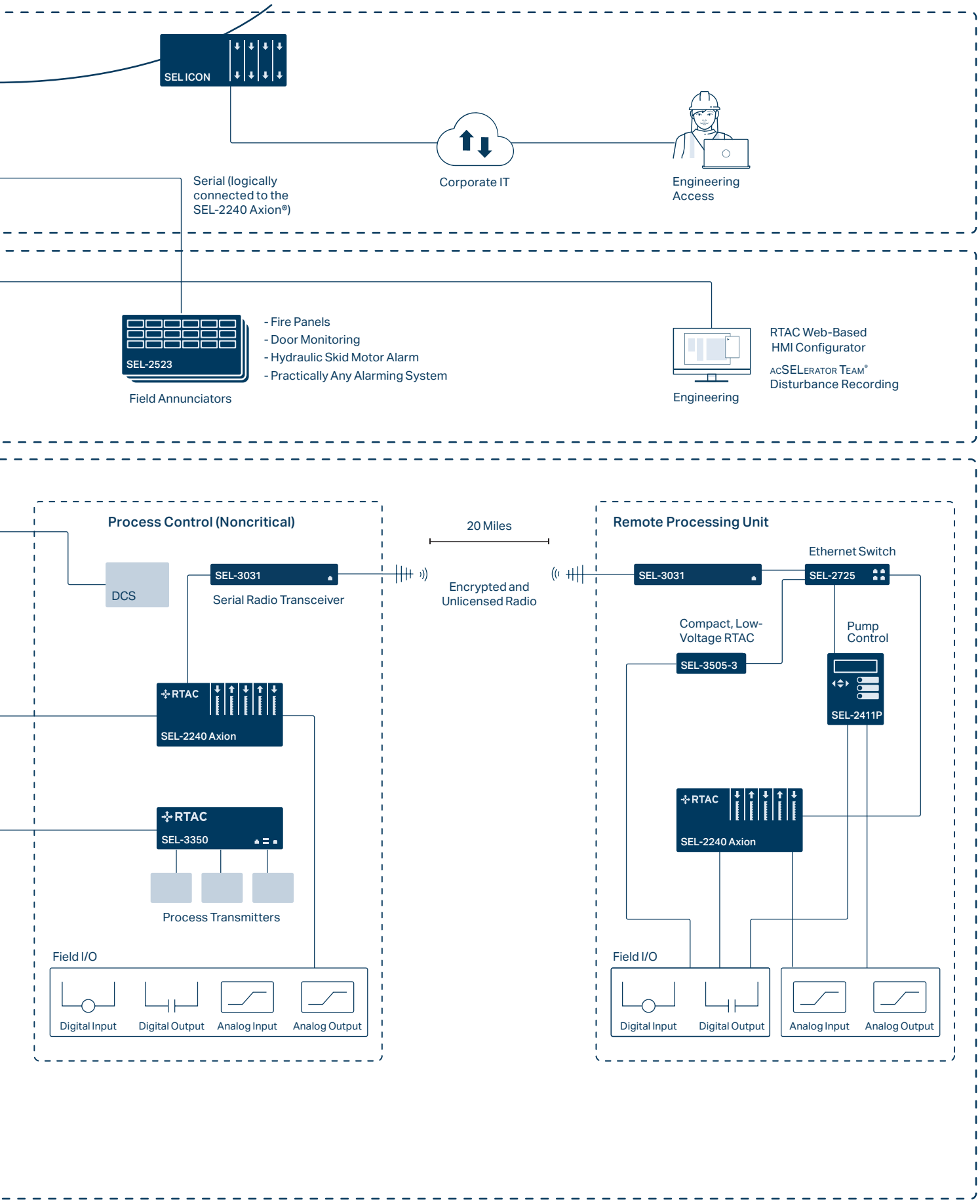


SEL SOLUTIONS INDUSTRIAL PLANT ONE-LINE DIAGRAM EXAMPLE

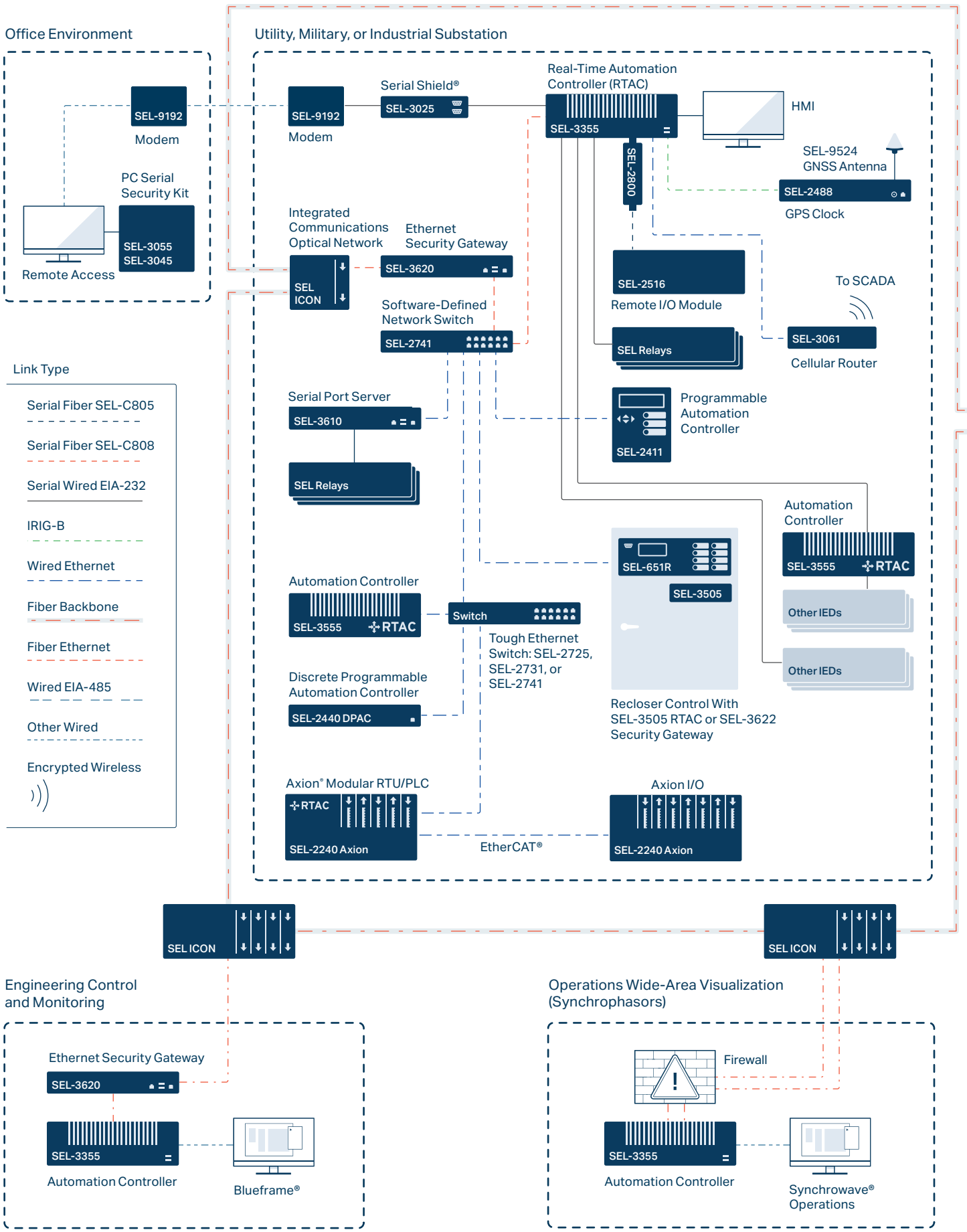

High-Impedance Differential Relay
SEL-787Z
86
52-M3
SEL-751
52-M4
86
High-Impedance Differential Relay
SEL-787Z
Power Quality & Revenue Meter
SEL-735
Power Quality & Revenue Meter
SEL-735
4.1 kV Bus 3
52-TJ
NO
4.1 kV Bus 4
SEL-710-5
Motor Protection
52-F31
SEL-2505
Remote I/O
52-F32
SEL-751
Feeder Protection With AFD
SEL-2533
Annunciator
52-F41
SEL-2505
Remote I/O
SEL-751
Feeder Protection With AFD
SEL-710-5
Motor Protection
Critical Motor
SEL-2600
RTD
4.1 kV
480 V
4.1 kV
480 V
LOW-VOLTAGE SUBSTATION*
RTAC
SEL-3350
RTAC
SEL-3350
MTM Scheme
SEL-751
SEL-751
Feeder Protection With AFD
SEL-751
52-M1L
52-M2L
480 V Bus 7
52-TN
NO
480 V Bus 8
52-G
Plant Loads
Plant Loads
SEL-700G
Generator Protection With Autosynchronization
MCC 3
Essential MCC 4
Feeder Protection With AFD
SEL-849
SEL-849
SEL-849
SEL-849
SEL-751
SEL-849
SEL-849
SEL-849
SEL-849
Motor Management With Arc-Flash Protection
Motor Management With Arc-Flash Protection
M
G
Differential Communications Via Fiber
Mirrored Bits® Communications Via Fiber
IEC 61850 MMS
Mirrored Bits Via Fiber Transfer Trip
IEC 61850 GOOSE Ethernet
Control Wire Connection
Active Arc-Flash Protection
*Local Integration Not Shown

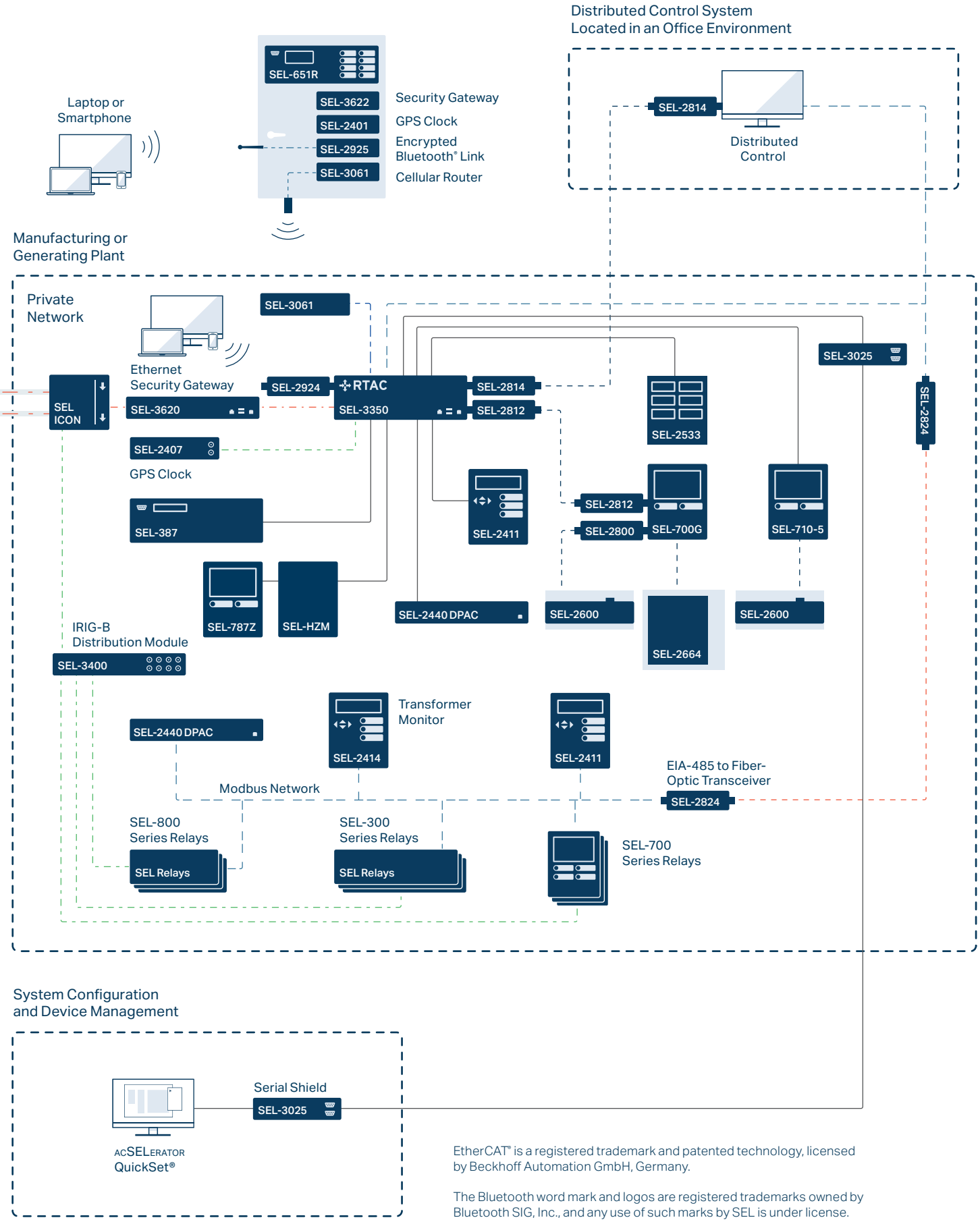
SEL SOLUTIONS INDUSTRIAL AUTOMATION DIAGRAM EXAMPLE




SEL ICON
Serial (logically connected to the SEL-2240 Axion®)
Corporate IT
Engineering Access
SEL-2523
Field Annunciators
- Fire Panels
- Door Monitoring
- Hydraulic Skid Motor Alarm
- Practically Any Alarming System
Engineering
RTAC Web-Based HMI Configurator
ACSELERATOR TEAM® Disturbance Recording
Process Control (Noncritical)
20 Miles
Remote Processing Unit
DCS
SEL-3031
Serial Radio Transceiver
Encrypted and Unlicensed Radio
SEL-3031
Ethernet Switch
SEL-2725
Compact, Low-Voltage RTAC
SEL-3505-3
Pump Control
SEL-2411P
RTAC
SEL-2240 Axion
RTAC
SEL-3350
Process Transmitters
RTAC
SEL-2240 Axion
Field I/O
Digital Input
Digital Output
Analog Input
Analog Output
Field I/O
Digital Input
Digital Output
Analog Input
Analog Output

SEL SOLUTIONS NETWORK COMMUNICATIONS DIAGRAM EXAMPLE





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ORDERING AND CUSTOMER SUPPORT

selinc.com/support | +1.509.338.3838

Online Configuration and Ordering

Configure products to meet your exact application needs and order them online with an SEL account. Once logged in, select "Configure and Order" on a product webpage to choose from available model options, including items like power supply voltages, inputs and outputs, communications ports and protocols, and conformal coating. Save individual products to your cart, create projects to house specific product orders, and request a quote—all online. For products that do not require configuration or have been identified as common product configurations, select "Popular Models" on a product webpage to quickly and easily find the model you want.

Ordering Support

Our sales representatives and customer service teams are always happy to answer questions and help configure the right SEL solution for your application. Visit selinc.com/support for regional sales contact information.

Popular Models

The Popular Models program makes selecting and ordering SEL products simple, fast, and convenient. SEL popular models are products preconfigured for popular applications and available for many SEL devices. Specific popular models may ship from stock. When available, the popular model configurations are displayed on the related SEL product webpage, where you can also view their technical details and popular applications. You can order these models directly from SEL or through your SEL sales representative.

Local Support. Global Expertise.

Whether it's grid modernization in the Philippines or an ambitious offshore wind integration project in Belgium, our global engineering experts have helped projects in regions like yours succeed. And with local support from technical staff in your region, you can count on us to help your successes continue.

Scan to find a customer support representative in your area.

selinc.com/heavy-industry

