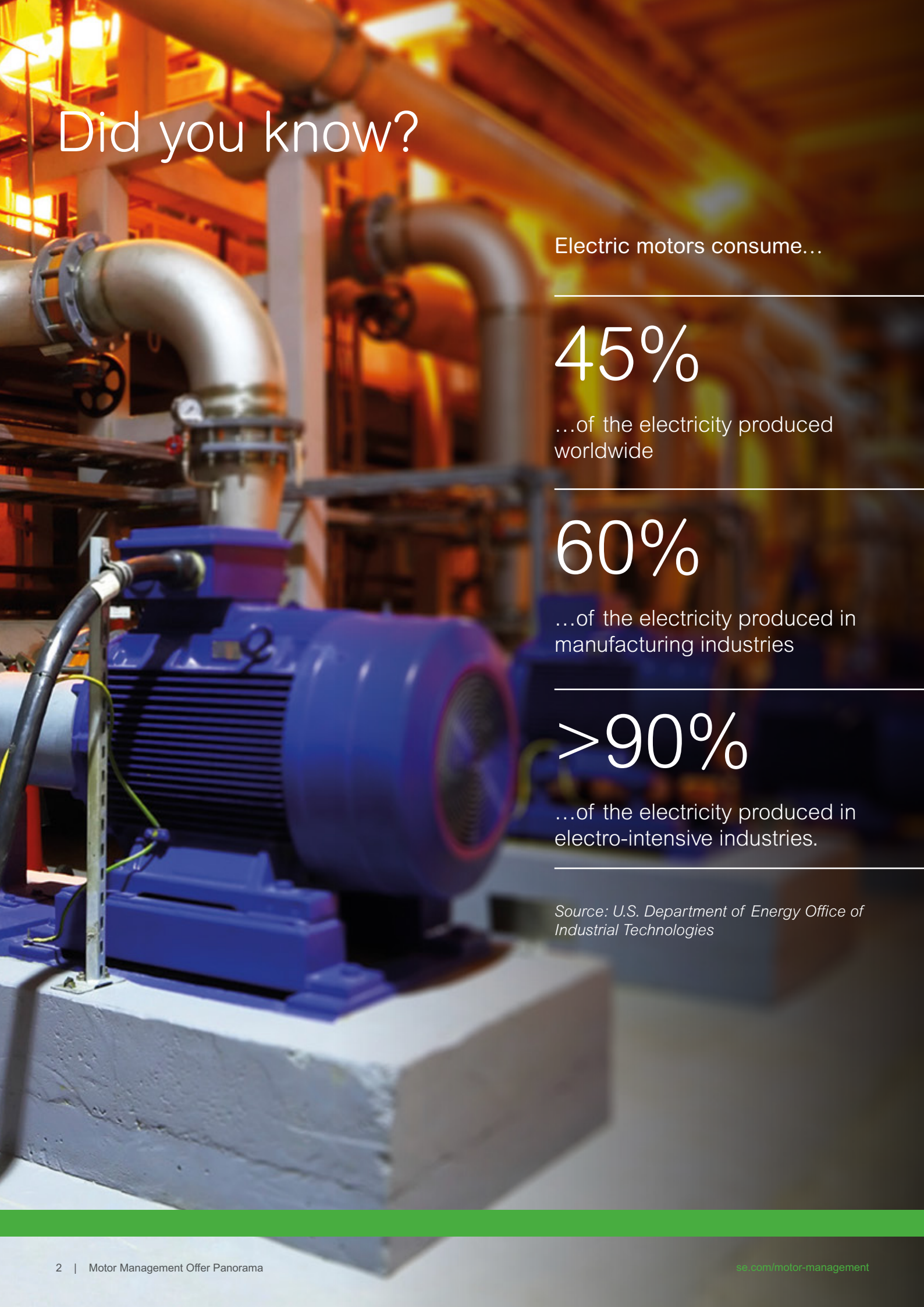
# Motor Management Offer Panorama

Offer Selection for Electric Motor Applications in process industries

se.com/motor-management

Life Is On Schneider Electric



# Did you know?

Electric motors consume…

## 45%

…of the electricity produced worldwide

## 60%

…of the electricity produced in manufacturing industries

## >90%

…of the electricity produced in electro-intensive industries.

*Source: U.S. Department of Energy Office of Industrial Technologies*

# General Contents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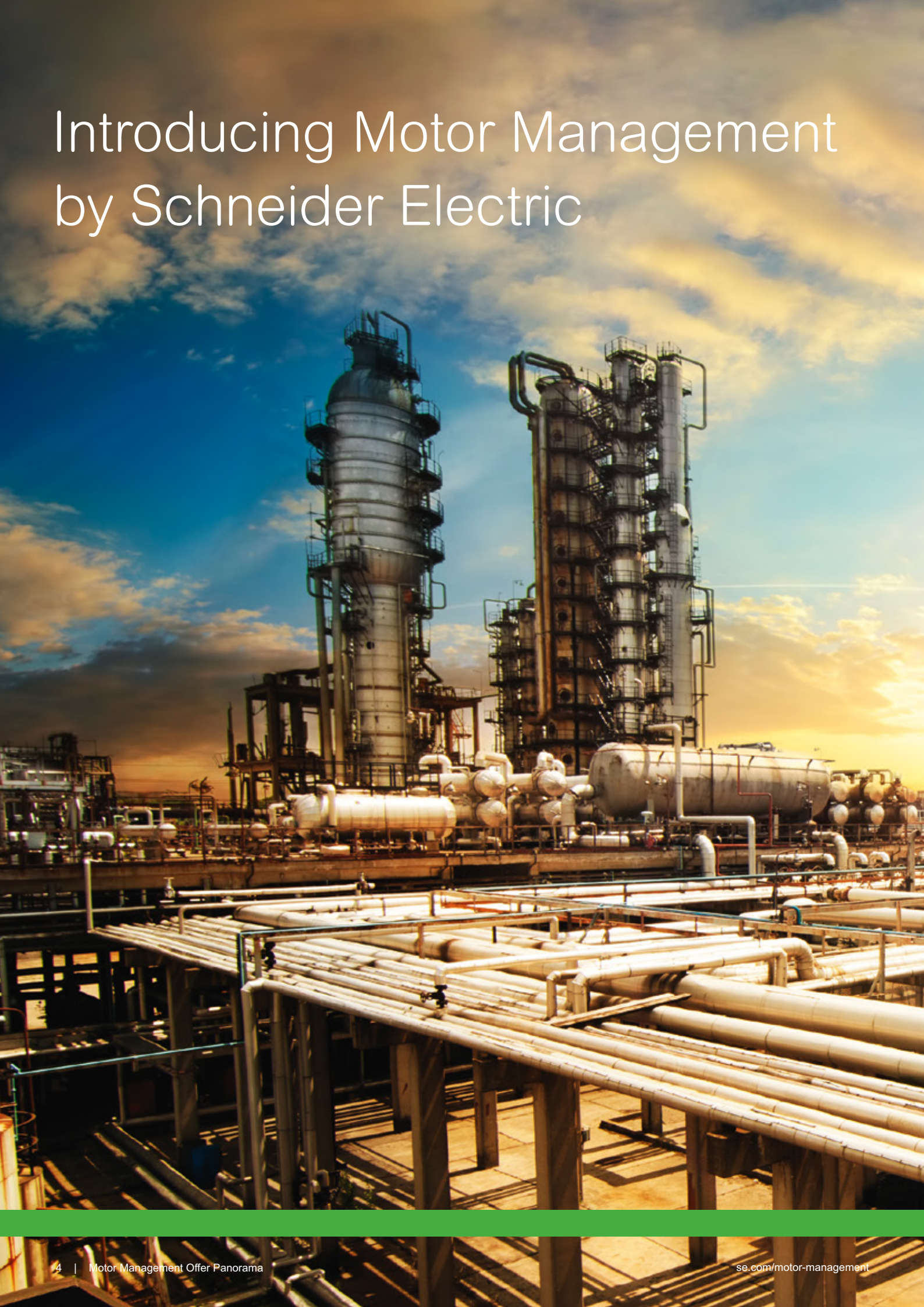
# Introducing Motor Management by Schneider Electric



Up to
20%
**investment savings**
thanks to the suitable voltage level.

Up to
30%
**savings**
thanks to the proper engineering of Motor Management solutions.

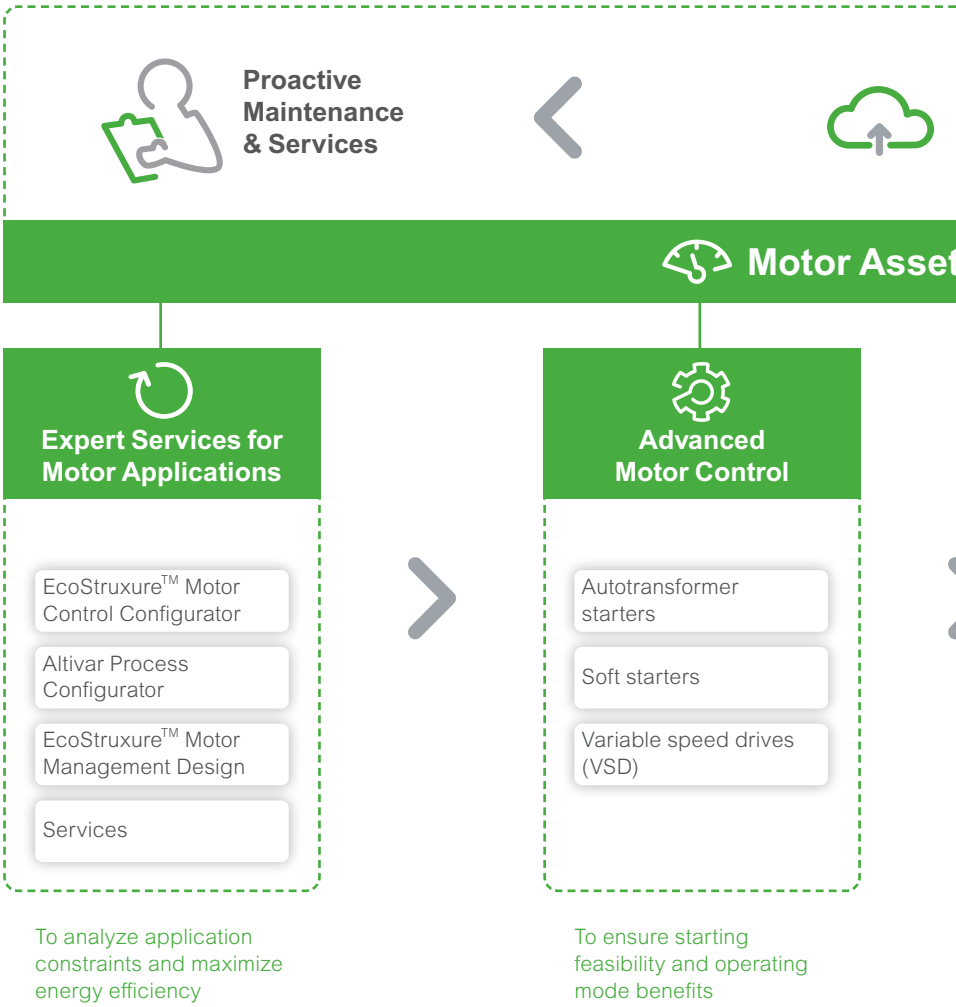
**Improved productivity and energy efficiency** thanks to the digital services and analytics

A

# Motor Management by Schneider Electric

Schneider Electric has developed a complete approach to meet the challenges you are facing. With five fundamental domains of expertise and a rich offer portfolio, we ensure the optimization of your investment and operating costs.

Every relevant parameter of your electrical system and process is considered to build the most suitable and complete solution for your motor applications.



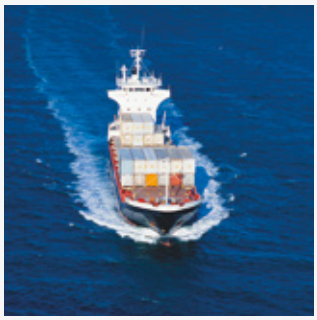
A

Motor Management is crucial for industries where service continuity and process availability are key.

Water and Wastewater

Mining, Minerals and Metals

Oil and Gas


Marine

**Software & Cloud Analytics**

**Data collection**

**t Management**

**Motor Protection & Control**

- Protection relays
- Switchboards & motor starters

To define suitable protection and integration in the industrial control system

**Power Quality**

- Power factor correction
- Harmonic mitigation
- Transformers (indoor & outdoor)

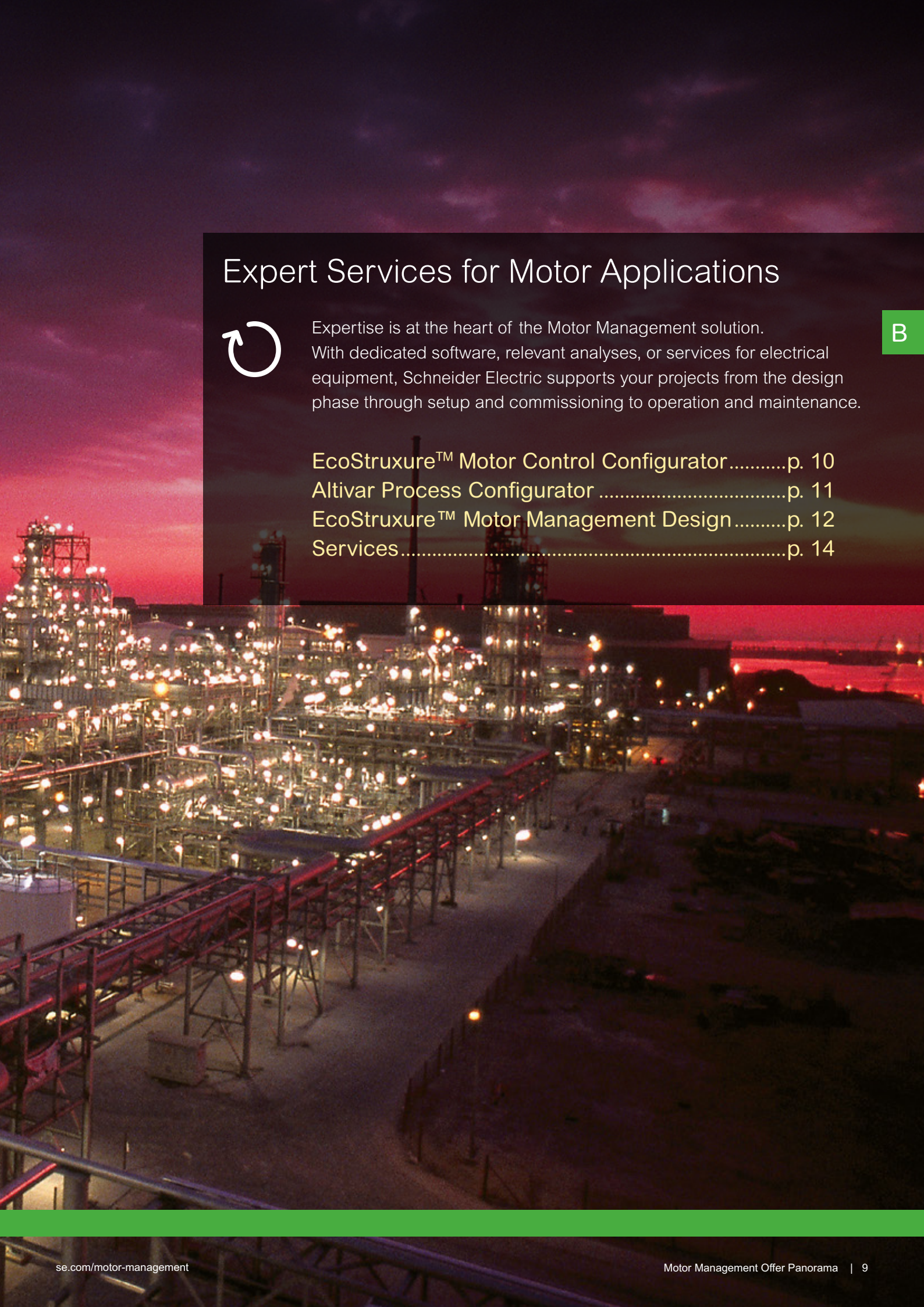
To reduce risk of installation failure

To maximize uptime

Through condition assessment or by using historian data, motor and application failures can be avoided at an early stage. We offer an extensive range of products to help you in this approach.

More details on page 47

# Motor Management Offer Selection Panorama



# Expert Services for Motor Applications

B

Expertise is at the heart of the Motor Management solution.
With dedicated software, relevant analyses, or services for electrical equipment, Schneider Electric supports your projects from the design phase through setup and commissioning to operation and maintenance.


EcoStruxure™ Motor Control Configurator ..... p. 10
Altivar Process Configurator ..... p. 11
EcoStruxure™ Motor Management Design ..... p. 12
Services ..... p. 14

# EcoStruxure™ Motor Control Configurator

Web application to select the right combination for protection and control of your motors.

Depending on the needs of your application, the EcoStruxure™ Motor Control Configurator supports you in the selection of components to control and protect the electric motor.

## 3 STEPS TO BUILD YOUR COMPLETE MOTOR CONTROL SOLUTION

**SELECT**

**Select** the motor starter technology, supply voltage, power and application

**ADJUST & ACCESSORIZE**

**Adjust** the configuration and **accessorize** the products

**SAVE**

**Save** the Bill of Materials (BOM)

**READY TO BE SHARED**

**Share** the BOM with your colleagues and partners

### Purpose of the app

To select the right motor starter combination in a few clicks.

### Group of users

- OEM
- Specifiers
- Panel builders
- Contractors

### Key values

- Easy to use tool for motor control configuration
- Print, save, export and share your solution
- Suitable for any device:

Desktop Tablet Smartphone

**Save time selecting** the right motor starter combination

**Get a complete and proven motor starter solution,** including accessories

**Be ready with associated product documentation** accessible at the click of a button

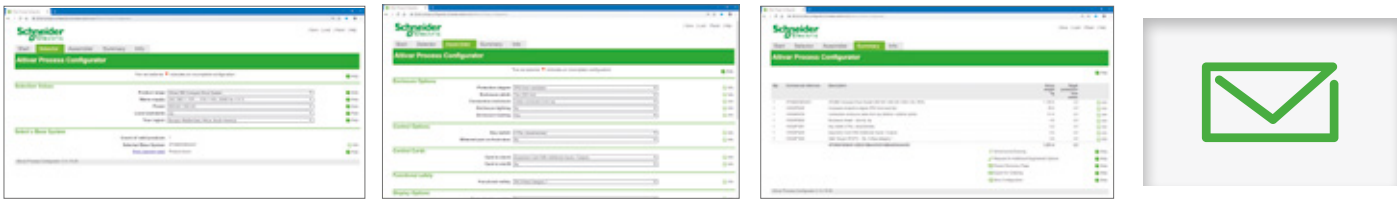
LET'S CONFIGURE YOUR MOTOR CONTROL SOLUTION AT: **HTTPS://WWW.SE.COM/MYSCHNEIDER/CONFIGURATORS/MCC**

# Altivar Process Configurator

Web application for quick quotation and configuration for typical drive applications.



## 3 STEPS TO CONFIGURE YOUR INDIVIDUAL DRIVE



**SELECT** → **ASSEMBLE** → **SUMMARIZE** → **READY TO ORDER**

**Select** your drive by range, voltage and power

**Assemble** your drive by selecting your required options

**Summarize** your configured drive with options

**Send** configuration file to Customer Care Center

### Purpose of the app

To configure and get a quotation for typical drive applications.

### Group of users

- Specifiers
- Panel builders
- Contractors
- End-users

### Key values

- Configure and quote your individual Drive System using the same tool
- Easily customizable Configured Drive Systems (CTO) to suit your specific requirements
- Pre-defined CTO options (e.g. enclosure plinth, cabling from top/bottom, braking unit, enclosure lighting/heating, front display module, motor heating, circuit breaker, etc.).

**Reduce the delivery time significantly**
for individually adapted drives, thanks to pre-defined options

**Quickly customize Configured Drive Systems**
to meet your requirements

LET'S CONFIGURE YOUR DRIVE AT: **ALTIVAR-PROCESS-CONFIGURATOR.SCHNEIDER-ELECTRIC.COM**

# EcoStruxure™ Motor Management Design

Web application for quick, easy calculation and offer selection for LV and MV motor applications.

## 3 STEPS TO MOVE FROM PROJECT TO SOLUTION

**PROJECT**

**Define** your project by objective, activity and application type

**CALCULATION**

**Compare** alternatives for starting and operation, considering their impact on the electrical network parameters

**SOLUTION**

**Build** your motor management architecture with recommended offers

**PROJECT REPORT**

**Get** an exhaustive project report (.pdf)

## ALL ALONG YOUR JOURNEY

**GET SUPPORT**
to use the tool

Detailed explanations to understand the inputs and outputs

**GET HELP**
to make choices

Decision tables with qualitative criteria

**GO FURTHER**
with digital content in connection

Blog posts, Guides, White papers, online tools, etc.

### Purpose of the app

To design Motor Management architectures for motor applications and help in evaluating energy efficiency for relevant applications.

### Group of users

- Consultants
- Panel builders
- Contractors
- End users

### Key values

- Complete motor management design approach: application, start & control, protection, power quality and asset management, energy efficiency and environmental impact.
- Easily achievable optimized and competitive designs, with limited input data
- Easy to use for newcomers and experts, with built-in help
- Management of multiple projects
- Embedded user feedback routines

**Save time and gain efficiency**
in electrical design when upgrading/extending with motors

**Benefit from simplified offer selection procedures**
to build a complete motor management architecture (from starting & control to services)

**Access to the most relevant digital content**
for a concrete case

LET'S START YOUR JOURNEY AT: **ECOSTRUXURE-MOTOR-MANAGEMENT.SE.APP/DESIGN**

B

# Services

## Assessment and Planning

Reduce risk and improve reliability

From planning a new installation to assessing the existing equipment, our consultants will help you identify potential safety and cybersecurity issues to reduce risk and improve reliability.

**For Industrial Automation**

Operation consulting: Our experts help optimize system investments, so you can focus on asset performance, regulatory compliance, and real-time control.

Industrial Safety Services: Our safety services help ensure your plants and equipment are well-designed, operated safely, and properly maintained.

**For Electrical Distribution**

MPS Consulting services: We pursue three goals - modernization, performance, and safety - that drive our decisions to help prioritize your investment.

Arc Flash assessements and analysis: We provide comprehensive arc flash analysis and information to help keep your employees and installations safe.

## Installation and Commissionning

Ensure optimal perfomance

Install your electrical, industrial, and data center equipment according to the manufacturer's specifications to ensure optimal performance, and minimized risk of failure.

**For Industrial Automation**

Automation desing engineering & execution: Keep your project on time, on budget and of premier quality, with our best-in-class design, engineering and execution processes.

Drive start-up and commissionning: Optimize and protect the investment in your drive systems with drive services designed to meet your needs at every stage of the lifecycle.

## Operation and Maintenance Services

On-site and remote support

Get state-of-the-art on-site maintenance and remote monitoring of your critical assets with expertise of our engineers, to keep your facility running smoothly, safely, and efficiently.

**For Critical Power & Cooling**

EcoStruxure Asset Advisor: Maximum protection of your critical equipment delivered with 24/7 real-time monitoring.

Monitoring and Dispatch Services: Advisors for your distributed edge infrastructure, combining 24/7 remote monitoring and on-site support.

Critical facility operations: Our dedicated staff on site will operate and maintain your data center utilizing industry best practice.

**For Electrical Distribution**

Electrical Distribution Service Plans: Achieve true peace of mind knowing your installation is covered by the right services plan.

Maintenance Services for Electrical Distribution: A complete solution to help maintain your equipment, ensuring service continuity.

**For Industrial Automation**

Automation maintenance and support: Take advantage of the numerous benefits of our maintenance and support services programs.

Operation Optimization Services: Our operator performance services help proactively meet production challenges.

Maintian and revitalize your key drive systems: Extend the life and maintain the value of your drives.

## Safety Services

Protect your site and staff

Use our extensive knowledge of functional safety, standards, and regulatory compliance to help keep your employees and equipment safe and protected.

Safety services for Industrial Automation: Our safety services ensure that your plants and equipment are well designed, operated safely and properly maintained.

Electrical Digital Twin Service: A service offer to digitize the customer single-line diagram with ETAP software and provide ongoing model maintenance support in a recurring mode.

MPS Consulting services: The three goals behind MPS - modernization, performance, and safety, are at the heart of what we deliver to help prioritize your investments.

Arc flash assessment and analysis: With our comprehensive arc flash analysis and assessment you can keep your employees and installation safe.

## Spare Parts

Get the right parts at the right time

Reduce downtime and return to full operation sooner by having spare parts available on site.

Electrial spare parts management: Access original spare parts of current and discontinued products during your equipment's full life cycle.

Automation maintenance and support: Stored locally or delivered, your critical parts are always available when you need them.

# Services

## Modernize

Update your aging equipment

Control the costs associated with aging equipment and improve its performance and flexibility by upgrading your electrical installations, modernizing your data center, and upgrading your automation systems.

### Electrical Installation renewal

Modernize wih ECOFIT: Find out how you can modernize your electrical distribution switchgear with Schneider Electric.

Upgrade or Replace: Enhance security and reduce downtime for greater peace of mind by monitoring, analyzing and optimizing your critical connected products.

### Automation System Upgrade

Upgrading, Planning and Management: Successful modernization requires careful planning and management by people who understand the big picture of your operation, interconnected technologies, and who are focused on measurable business value.

DCS Migration and Upgrade: Our unique, award-winning DCS migration programs can get you to the safety, security and productivity that can come with a new DCS, often with significantly lower cost and disruption than other options.

PLC Migration and Upgrade: Improve your productivity and protect your valuable technology investment. Upgrade your PLCs to modern, state-of-the-art equipment using simple, effective, and affordable upgrade tools and quick wiring adapters.

Drives Revitalization: Extend the life and value provided by your critical drives with services to reduce the risks of failure while providing a clear path for IoT value.

B

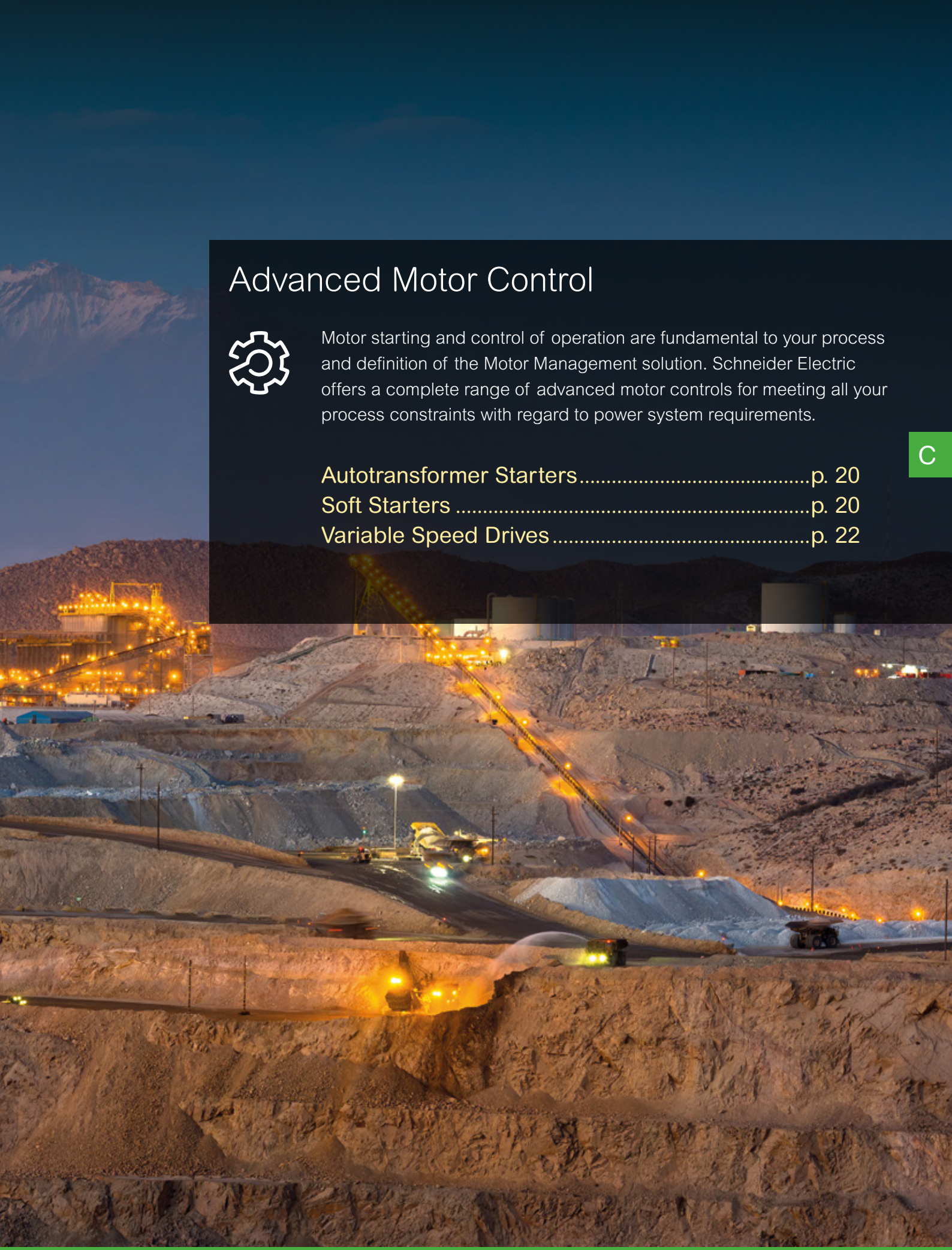
# Motor Management Offer Selection Panorama

# Advanced Motor Control

Motor starting and control of operation are fundamental to your process and definition of the Motor Management solution. Schneider Electric offers a complete range of advanced motor controls for meeting all your process constraints with regard to power system requirements.

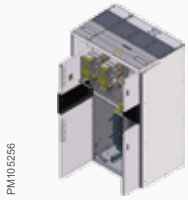

Autotransformer Starters ..... p. 20
Soft Starters ..... p. 20
Variable Speed Drives ..... p. 22


C



## Autotransformer Starters

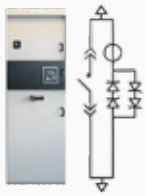
## Soft Starters

| Model 6<br>MCC/iMCC RVAT | Motorpact<br>RVAT | Altivar<br>Soft Starter ATS22 | Altivar<br>Soft Starter ATS480 | BlokSeT<br>PMCC/iPMCC soft starter |
|---|---|---|---|---|
| |  | | | |
| **Distribution and motor control switchboard** | **Autotransformer motor starter** | **Soft starters for Standard Machines** | **Soft starters for Process and Infrastructures** | **LV distribution and motor control center** |
| **Main standards and certifications** | | | | |
| NEMA, CSA, UL, ABS | IEC, NEMA, DNV, BV, LR, ABS | EN/IEC 60947-4-2<br>CE, UL, CSA, C-Tick, CCC, GOST | IEC/UL 60947-4-2<br>CE, cULus, UCKA, CCC, RCM, EAC, DNV, BV, CCS | IEC, CCC |
| **Motor voltage range** | | | | |
| 208…600 V | 2.2…7.2 kV | 230…440 V / 208…600 V | 208…690 V | 400…690 V |
| **Motor power range** | | | | |
| 15…300 kW<br>20…400 HP | ≤ 3,800 kW | 4…400 kW | 4…900 kW | ≤ 250 kW<br>(315 kW @ 500 V) |
| **Application segments** | | | | |
| | | | | |
| **Motor applications** | | | | |
| • Pump<br>• Compressor<br>• Fan | • Pump<br>• Compressor<br>• Fan | Normal Duty applications:<br>• Pumps, Fans, Compressors, Conveyors | Normal and Heavy Duty applications:<br>• Pumps, Fans, Compressors, Conveyors<br>• Crusher, Grinder, Press, Circular saw | • Centrifugal pump<br>• Centrifugal compressor<br>• Fan |
| **Motor Management functions** | | | | |
| • Gradual motor starting in steps<br>• Motor protection through protection relay<br>• Direct stop<br>• Circuit breaker or fused switch disconnects<br>• Start and bypass contactors<br>• Fixed, disconnectable, and withdrawable functional units | • Gradual motor starting in steps<br>• Motor protection through protection relay<br>• Direct stop<br>• LSC2A with line disconnector<br>• Start and bypass contactors<br>• Monitoring of temperature rise | • Soft start/Soft stop unit for 3-phase asynchronous motors<br>• Integrated motor and starter protection<br>• Integrated bypass contactor<br>• Communication through Modbus RTU | • Soft start/Soft stop unit for 3-phase asynchronous motors IE2, IE3, IE4<br>• Robust Torque Control System (TCS)<br>• Integrated motor and starter protection<br>• Environment protection reinforcement<br>• Communication through Modbus RTU, CANopen, Modbus TCP, EtherNet/IP, PROFIBUS, PROFINET | • Integrated ATS480 soft starter<br>• Centralized and modular motor control, using conventional and intelligent motor control centers (MCC/iMCC)<br>• Mixed feeders (power distribution/motor control) |
| **Motor Management benefits** | | | | |
| • IAC 100 kA/0.4 s<br>• Seismic qualified<br>• Recommended communication architecture with TVDA | • IAC 50 kA/0.25 s (including autotransformer)<br>• Seismic 2.7G<br>• Available with PFC<br>• Small footprint<br>• Standalone or coupled to PIX/MCset switchboard<br>• One tool and all operations from front | • Reduce footprint in the cabinet thanks to integrated bypass<br>• Save time on wiring<br>• Simple to commission | • Reduce Engineering time and cost<br>• Enable evolution of existing installations<br>• Increase continuity of service<br>• Enhance cybersecurity<br>• Superior Sustainability | • IAC 85 kA/0.4 s<br>• Earthquake/seismic 2G<br>• Integration of capacitor banks and harmonic compensation<br>• Recommended communication architecture with TVDA |

Mining Metals & Minerals  Wastewater  Oil and Gas  Marine

For typical motor characteristics: | Eff=0.96 | PF=0.88 |

## Soft Starters

| Okken<br>PMCC/iPMCC soft starter | Model 6<br>MCC/iMCC soft starter | Motorpact<br>RVSS | Motorpact<br>RVSS S3 | Motorpact<br>RVSS standalone |
|---|---|---|---|---|
| | | | |  |
| **LV power distribution and motor control center** | **Distribution and motor control switchboard** | **Reduced voltage soft starter** | **Reduced voltage sequential soft starter** | **Reduced voltage soft starter** |
| **Main standards and certifications** | | | | |
| IEC, DNV, RINA, BV, Shell DEP, EAC (GOST), CCC | NEMA, CSA, UL, ABS | IEC, NEMA, DNV, BV, LR, ABS | IEC, NEMA, DNV, BV, LR, ABS | IEC, NEMA, DNV, BV, LR, ABS |
| **Motor voltage range** | | | | |
| 400…690 V | 208…600 V | 2.2…7.2 kV | 2.2…7.2 kV | 2.2…7.2 kV |
| **Motor power range** | | | | |
| ≤ 250 kW<br>(315 kW @ 480 V) | 2.2…450 kW<br>3…600 HP | ≤ 3,800 kW | ≤ 3,800 kW | ≤ 3,800 kW |
| **Application segments** | | | | |
| | | | | |
| **Motor applications** | | | | |
| • Centrigugal pump<br>• Centrifugal compressor<br>• Fan | • Pump<br>• Compressor<br>• Fan | • Pump<br>• Compressor<br>• Fan | • Pump<br>• Compressor<br>• Fan | • Pump<br>• Compressor<br>• Fan |
| **Motor Management functions** | | | | |
| • Integrated ATS480 soft starter<br>• Centralized and modular motor control, using conventional and intelligent motor control centers (MCC/iMCC)<br>• Mixed feeders (power distribution/motor control)<br>• Fixed, disconnectable, and withdrawable functional units | • Integrated ATS480 soft starter<br>• Centralized and modular motor control, using conventional and intelligent motor control centres (MCC/iMCC)<br>• Mixed feeders (power distribution/motor control)<br>• Fixed functional units | • Soft start/soft stop unit for 3-phase asynchronous motors<br>• Dual ramp setup<br>• Integrated bypass contactor for motor running<br>• Motor protection through protection relay<br>• Thermal withstand 5 x In for 60 s<br>• LSC2A-PI with line disconnector | • Soft start/soft stop unit for 3-phase asynchronous motors<br>• Dual ramp setup<br>• Integrated bypass contactor for motor running<br>• Motor protection through protection relay<br>• Thermal withstand 5 x In for 60 s<br>• LSC2A-PI with line disconnector<br>• Multi-motor sequential (cascaded) starting | • Soft start/soft stop unit for 3-phase asynchronous motors<br>• Dual ramp setup<br>• Integrated bypass contactor for motor running<br>• Motor protection through protection relay<br>• Thermal withstand 5 x In for 60 s |
| **Motor Management benefits** | | | | |
| • IAC 100 kA/0.5 s<br>• Seismic 2.7 & 5G (nuclear)<br>• Recommended communication architecture with TVDA | • IAC 100 kA/0.4 s<br>• Seismic qualified<br>• Recommended communication architecture with TVDA | • IAC: 50 kA/0.25 s<br>• Seismic 2.7G<br>• Available with PFC<br>• Space saving<br>• Reduced number of maintenance points (<40%)<br>• Standalone or coupled to PIX/MCset switchboard<br>• One tool and all operations from the front | • IAC: 50 kA/0.25 s<br>• Seismic 2.7G<br>• Space saving<br>• Reduced number of maintenance points (<40%)<br>• Standalone or coupled to PIX/MCset switchboard<br>• One tool and all operations from the front<br>• Available with PFC | • IAC: 50 kA/0.25 s<br>• Seismic 2.7G<br>• Available with PFC<br>• Space saving<br>• Reduced number of maintenance points (<40%)<br>• One tool and all operations from the front<br>• Standalone coupled to existing circuit breaker/contactor |

Mining Metals & Minerals Wastewater Oil and Gas Marine

For typical motor characteristics: | Eff=0.96 | PF=0.88 |



C

## Variable Speed Drives

| Drive products ATV630/650 | Drive products ATV930/950 | Drive systems ATV660, ATV6A0, ATV6L0 | Drive systems ATV680, ATV6B0 | Drive systems ATV960, ATV9A0, ATV9L0 |
|---|---|---|---|---|
| PM105264 | PM105264 | PM105265 | PM105266 | PM105267 |
| LV drive products for pumping & fan applications | LV drive products for solid & mechanics movement | LV compact drive systems | LV low harmonic drive systems | LV high performance drive systems |
| **Main standards and certifications** | | | | |
| IEC, NEMA, DNV, UL | IEC, NEMA, DNV, UL | EN/IEC, UL | EN/IEC, UL, IEEE 519 | EN/IEC, UL |
| **Motor voltage range** | | | | |
| 200…240 V<br>380…480 V | 200…240 V<br>380…480 V | 380…480 V<br>500…690 V | 380…480 V<br>500…690 V | 380…480 V<br>500…690 V |
| **Motor power range** | | | | |
| 0.75…315 kW | 0.75…315 kW | 90…2,600 kW | 90…1,200 kW | 90…2,600 kW |
| **Application segments** | | | | |
| | | | | |
| **Motor applications** | | | | |
| • Compressor<br>• Fan<br>• Pump | • Artificial lift<br>• Conveyors<br>• Crushing<br>• Mills<br>• Special cranes | • Archimedes screws<br>• Centrifugal and volumetric pumps<br>• Compressors<br>• Fans<br>• Oil and fuel pumps | • Archimedes screws<br>• Centrifugal and volumetric pumps<br>• Compressors<br>• Fans<br>• Oil and fuel pumps | • Artificial lift<br>• Centrifuges<br>• Conveyors<br>• Hoisting<br>• Mills<br>• Mixers<br>• Slurry pumps |
| **Motor Management functions** | | | | |
| • Motor control for asynchronous and synchronous motors<br>• Smart services: power measurement, Web server, dynamic QR code<br>• Advanced features for single pump and multipump system management<br>• Advanced features for power consumption and pumping system monitoring | • Advanced motor control for asynchronous, synchronous, and special motors<br>• Smart services: power measurement, Web server, dynamic QR code<br>• Full digital Master/Slave<br>• EcoStruxure™ Plant Hybrid DCS process automation systems | • Motor control for asynchronous and synchronous motors<br>• Smart services: power measurement, Web server, dynamic QR code<br>• Open loop control<br>• No braking nor 4Q<br>• Multi-pulse solutions<br>• Liquid cooled drive (ATV6L0) | • Motor control for asynchronous and synchronous motors<br>• Smart services: power measurement, Web server, dynamic QR code<br>• Open loop control<br>• No braking nor 4Q<br>• Low harmonic drive (for THDi <5%) | • Advanced motor control for asynchronous, synchronous, and special motors<br>• Smart services: power measurement, Web server, dynamic QR code<br>• Open and closed loop control<br>• Motor braking<br>• Multi-pulse solutions<br>• Embedded dual Ethernet<br>• Liquid cooled drive (ATV9L0) |
| **Motor Management benefits** | | | | |
| • Up to 60% energy savings on standby due to the innovative "Stop & Go" operation<br>• Designed for harsh environments (IEC/EN60721 3C3-3S3, and high temperature range)<br>• Improved lifetime of the system due to pump protection and monitoring features<br>• Optimization of pumping system operating point | • Up to 60% energy savings on standby due to the innovative "Stop & Go" operation<br>• Designed for harsh environments (IEC/EN60721 3C3-3S3, and high temperature range)<br>• Excellent motor performance on any type of motor<br>• Total control of any kind of coupling in master/slave applications | • Up to 60% energy savings on standby due to the innovative "Stop & Go" operation<br>• Designed for harsh environments with up to IP66 protection degree with liquid cooled drive and high temperature range<br>• Fully customizable drive systems<br>• Ready-to-use drive systems<br>• Tested at full load | • Up to 60% energy savings on standby due to the innovative "Stop & Go" operation<br>• Fully customizable drive systems<br>• Ready-to-use drive systems<br>• New Low Harmonic system concept based on unique 3-level technology<br>• Improved lifetime of the motor due to reduced voltage load<br>• Less heat loss compared to the classic AFE architecture | • Up to 60% energy savings on standby due to the innovative "Stop & Go" operation<br>• Designed for harsh environments with up to IP66 protection degree with liquid cooled drive and high temperature range<br>• Fully customizable drive systems<br>• Ready-to-use drive systems<br>• Tested at full load |

Mining Metals & Minerals Wastewater Oil and Gas Marine

For typical motor characteristics: | Eff=0.96 | PF=0.88 |

## Variable Speed Drives

| Drive systems ATV980, ATV9B0 | Drive systems ATV990 | BlokSeT PMCC/iPMCC VSD | Okken PMCC/iPMCC VSD | Model 6 MCC/iMCC VSD |
|---|---|---|---|---|
| PM105268 | PM105269 | PM107034 | PM105260 | PM105334 |
| **LV regenerative drive systems** | **LV multi-drive systems** | **LV Motor Control Center integrating VSD** | **LV Motor Control Center integrating VSD** | **LV Motor Control Center integrating VSD** |
| **Main standards and certifications** | | | | |
| EN/IEC, UL, IEEE 519 | EN/IEC | IEC | IEC, DNV, RINA, BV, Shell DEP, EAC (GOST), CCC | NEMA, CSA, UL, ABS |
| **Motor voltage range** | | | | |
| 380…480 V<br>500…690 V | 380…480 V | Up to 690 V | 380…690 V | 208…600 V |
| **Motor power range** | | | | |
| 90…1,200 kW | 1…1,000 kW | ≤ 160 kW | ≤ 160 kW | 0.75...250 kW<br>1...350 HP (500 HP @ 480 V) |
| **Application segments** | | | | |
| | | | | |
| **Motor applications** | | | | |
| • Artificial lift<br>• Centrifuges<br>• Conveyors<br>• Crushers, slurry pumps<br>• Hoisting<br>• Mills<br>• Mixers | • Industrial cranes for heavy loads<br>• Harbor cranes<br>• Overhead traveling and gantry cranes<br>• Tunnel boring machines | • Centrifugal pump<br>• Compressor<br>• Fan<br>• Volumetric pump | • Centrifugal pump<br>• Compressor<br>• Fan<br>• Volumetric pump | • Compressor<br>• Fan<br>• Pump |
| **Motor Management functions** | | | | |
| • Advanced motor control for asynchronous, synchronous, and special motors<br>• Smart services: power measurement, Web servers, dynamic QR code<br>• Open and closed loop control<br>• Motor braking and 4Q applications<br>• Highly efficient power regeneration<br>• Embedded dual Ethernet | • Advanced Motor control for asynchronous, synchronous, and special motors<br>• Smart services<br>• Open and closed loop control<br>• Motor braking and 4Q applications<br>• Highly efficient power regeneration<br>• Embedded dual Ethernet<br>• MultiDrive with common DC or AC bus | • Motor control for asynchronous and synchronous motors<br>• LV distribution and motor control switchboard integrating VSD<br>• Mixed feeders power distribution/motor control<br>• Fixed/withdrawable functional units | • Motor control for asynchronous and synchronous motors<br>• LV distribution and motor control switchboard integrating VSD<br>• Mixed feeders power distribution/motor control<br>• Fixed/withdrawable functional units | • Motor control for asynchronous and synchronous motors<br>• LV distribution and motor control center integrating VSD<br>• Mixed feeders power distribution/motor control<br>• Fixed functional units |
| **Motor Management benefits** | | | | |
| • Up to 60% energy savings on standby due to the innovative "Stop & Go" operation<br>• Fully customizable drive systems<br>• Ready-to-use drive systems<br>• New low harmonic system concept based on unique 3-level technology<br>• Improved lifetime of the motor due to reduced voltage load<br>• Less heat loss compared to the classic AFE architecture | • Up to 60% energy savings on standby due to the innovative "Stop & Go" operation<br>• Fully customizable drive systems<br>• Ready-to-use drive systems<br>• Tested at full load<br>• Energy savings due to highly efficient power regeneration<br>• Designed for harsh environments | • IAC 85 kA/0.4 s<br>• Seismic 2G<br>• EtherNet/IP<br>• dv/dt harmonic filters embedded<br>• Flexible and simple keypad<br>• Recommended communication architecture with TVDA | • IAC 100 kA/0.5 s<br>• Seismic 2.7G<br>• EtherNet/IP<br>• dv/dt harmonic filters embedded<br>• Flexible and simple keypad<br>• Recommended communication architecture with TVDA | • IAC 100 kA/0.4 s<br>• Seismic qualified<br>• EtherNet/IP<br>• dv/dt harmonic filters embedded<br>• Flexible and simple keypad<br>• Recommended communication architecture with TVDA |

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For typical motor characteristics: | Eff=0.96 | PF=0.88 |

C

## Variable Speed Drives

| Drive systems ATV6000 | Drive systems Altivar 1200H |
|---|---|
| PM108384 | PM105272 |
| **MV Variable Speed Drive systems** | **MV Variable Speed Drive systems** |
| **Main standards and certifications** | |
| EN/IEC, IEEE 519, EAC, CSA, UL | EN/IEC, IEEE 519, GOST |
| **Motor voltage range** | |
| 2.4…13.8 kV | 2.4…10 kV |
| **Motor power range** | |
| 300...20,000 kW | 240…7,000 kW |
| **Application segments** | |
| | |
| **Motor applications** | |
| • Conveyor<br>• Ball mill<br>• Crusher<br>• Fan<br>• Pump<br>• Compressor<br>• Extruder | • 2Q applications<br>• Ball mill<br>• Compressor<br>• Conveyor<br>• Crusher<br>• Fan<br>• Pump |
| **Motor Management functions** | |
| • Motor control for asynchronous and synchronous motors<br>• Dedicated application control features<br>• Pump characteristics setting<br>• Motor protection<br>• Load and Energy monitoring<br>• Speed and torque control mode<br>• Master slave up to 10 drives<br>• Open and closed loop control<br>• Soft start function, incl. synchronization and bypass<br>• IIoT-enabled solution | • Motor control for asynchronous and synchronous motors<br>• Multi-level topology featuring a 18-48 pulse diode rectifier and a low-voltage IGBT (THDi<3%)<br>• Large 10” touch screen<br>• Soft start function (including synchronization and bypass)<br>• Multi-motor control<br>• Master-slave and droop control |
| **Motor Management benefits** | |
| • Service Oriented Offer. Increase availability and reduce downtime for service continuity by 20%<br>• Digital Services (EcoStruxure™ Asset Advisor). More uptime & shorter recovery time with predictive maintenance and reduced TCO by up to 20%<br>• Energy management. Optimize usage of energy and reduce consumption by up to 30%<br>• Process optimization. Improve productivity and availability by up to 20%<br>• Tailored solutions. Optimize your operation efficiency and investment (time & expenditure) | • Seismic UBC4, high altitude 2000 - 4000 m.a.s.l<br>• Complete range of services<br>• Open to most communication networks<br>• All-in-one cabinet for reduced installation costs and quick commissioning<br>• Adapted to retrofit integration for DOL-operated motors |

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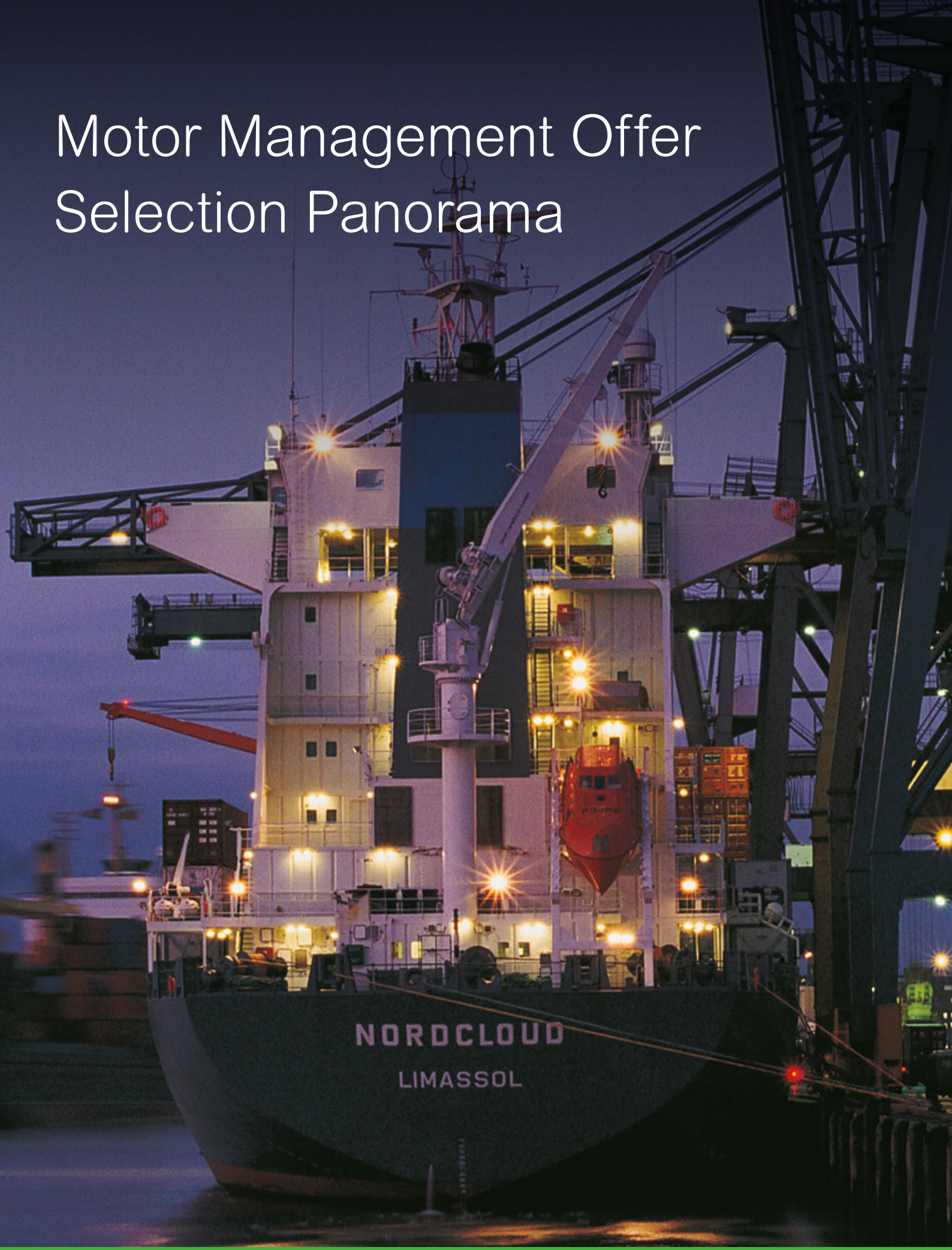
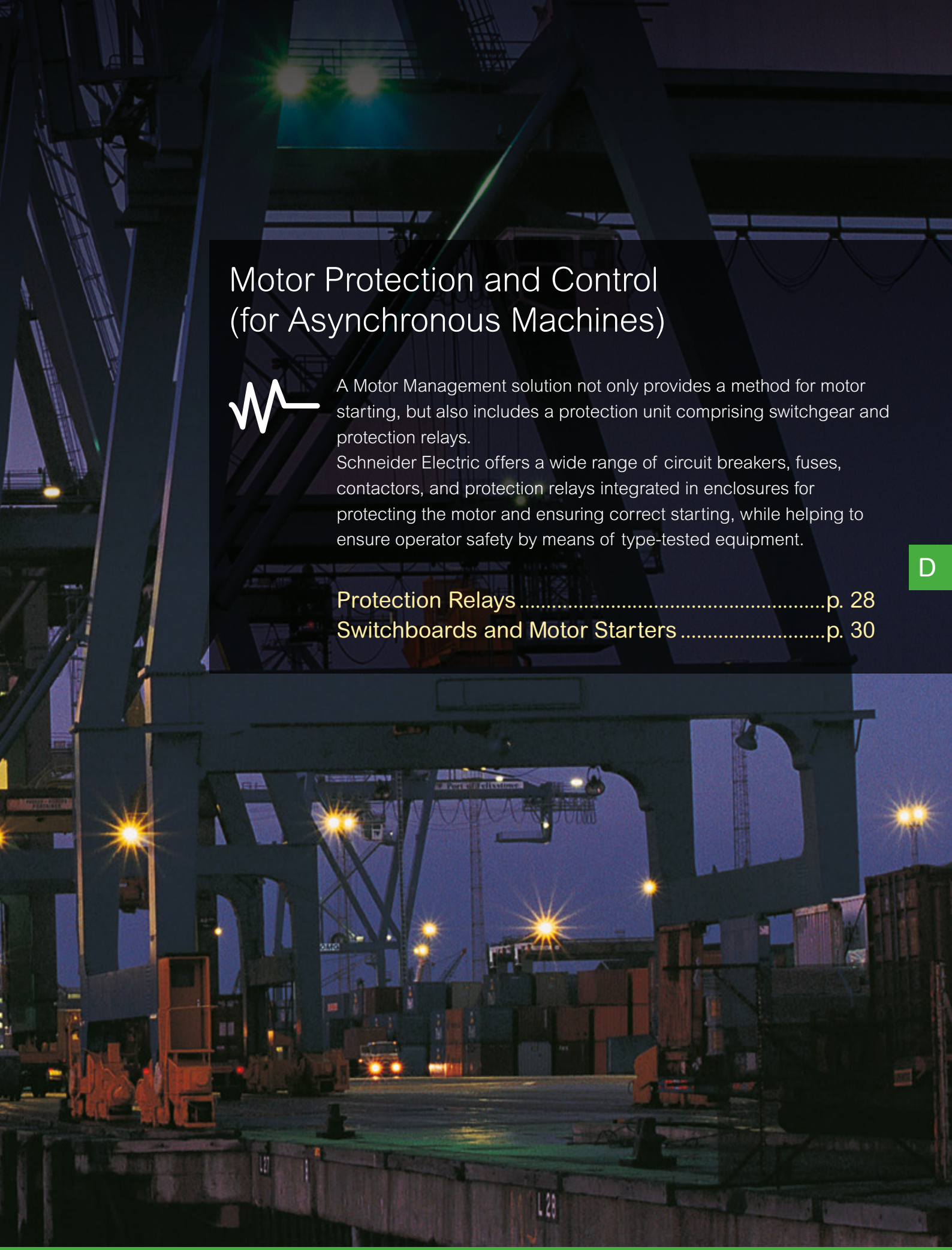
For typical motor characteristics: | Eff=0.96 | PF=0.88 |

C

# Motor Management Offer Selection Panorama





# Motor Protection and Control (for Asynchronous Machines)

A Motor Management solution not only provides a method for motor starting, but also includes a protection unit comprising switchgear and protection relays.
Schneider Electric offers a wide range of circuit breakers, fuses, contactors, and protection relays integrated in enclosures for protecting the motor and ensuring correct starting, while helping to ensure operator safety by means of type-tested equipment.


Protection Relays ..... p. 28
Switchboards and Motor Starters ..... p. 30


D

## Protection Relays

| TeSys Protect Deca | Tesys Protect Giga | TeSys Active TeSys T | MicroLogic |
|---|---|---|---|
| LRD06L | LR9G225 | LTMELV40BD - LTMR08EBD - PB112374 | PM107039 - PB104804 |
| **Thermal overload relay (LRD) for Deca contactors** | **Electronic protection relay (LR9G) for Giga contactors** | **EU, CCC, Marine (BV, LROS, DNV, RINA, ABS)** | **Electronic trip unit for ComPact NS/NSX circuit breaker** |
| **Main standards and certifications** | | | |
| IEC/EN,UL,CSA, GB/T,CCC, EAC, ATEX,ABS, BV, DNV-GL, LRoS, RINA, RMRS, EU RO Mutual recognition | CB Scheme, CCC, cULus, UKCA, ATEX, EU-RO-MR by DNV-GL | IEC/EN, UL, CSA, DNV, ATEX | IEC, ANSI, UL |
| **Motor voltage range** | | | |
| Low voltage | Low voltage | Low voltage | Low voltage |
| **Motor power range** | | | |
| ≤ 75 kW | ≤ 350 kW | 0.1...800 kW (690 V)<br>0.1...400 kW (400~440 V) | 0.37…1,250 kW |
| **Application segments** | | | |
| | | | |
| **Motor control type** | | | |
| DOL, star-delta, reverse speed | DOL, soft start, reverse speed | DOL, star-delta, reverse speed, two speed | DOL, soft start, VSD |
| **Motor Management functions** | | | |
| • Manual or automatic reset<br>• Sealable flap<br>• Pre-wiring kit<br>• Direct mounting onto TeSys Deca contactors<br>• Terminal block for separate mounting<br>• Remote electrical reset available as an option<br>• Connectors: spring terminal, screw clamp, terminal block EverLink (LRD3)<br>• Class 10 A & 20 | • For independent mounting or with TeSys Giga contactors<br>• Trip class selection: 5E/10E/20E/30E<br>• Overload, phase imbalance, phase loss and ground fault protections<br>• Manual and auto reset options<br>• LED indicator for Motor ON and pre-trip alarm<br>• Thermal memory and compensation<br>• Push-in terminals for control connections | • Communication protocols: EtherNet/IP, Modbus/TCP, Modbus RTU, Profibus-DP, CANopen, DeviceNet<br>• Custom logic<br>• Measurements: current, voltage, active, and reactive power<br>• Protections: current/voltage: over/under, thermal protection, etc.<br>• Current/voltage phase and balance, load shedding, auto restart<br>• Motor temperature sensors: PTC, NTC, etc. | • 4 levels of protection against overloads and short circuits<br>• 4 types of measurement: A (Ammeter), E (Energy), P (Power)<br>• Measurement accuracy: Class 0.5 for voltage, class 1.5 for current and class 2 for active power and energy<br>• Compatible with both Ethernet and Modbus SL protocols |
| **Motor Management benefits** | | | |
| • Safe and effective protection<br>• Simple to install<br>• Integrated manual-automatic reset<br>• Can be combined with TeSys Deca contactors to form an extremely optimized starter | • New generation of electronic overload relays 28-630 A<br>• Less product references for easier selection and less inventory<br>• Wide setting range with advanced protections<br>• Full set of features for more flexibility<br>• Continuous monitoring with health and alarm indicators | • Advanced motor protection from basic to mission-critical applications<br>• Warning of potential issues through intuitive pre-fault alarms<br>• Maximum flexibility with expandable I/O module<br>• Adaptable to any process control system through custom programmable logic<br>• FDR: Fast Device Replacement service with screen to allow easy maintenance | • Integration into a power monitoring system<br>• Interchangeable, easy to upgrade<br>• All-in-one compact relay avoiding use of additional relays for measurement |

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For typical motor characteristics: | Eff=0.96 | PF=0.88 |

## Protection Relays

| Easergy P3 | PowerLogic P5 | Easergy MiCOM P24x | Easergy Sepam 60 & 80 |
|---|---|---|---|
| PM106366-5 | PM107320 | PM105296 | PM105293 |
| **Compact protection relays** | **Withdrawable protection relays** | **Rotating machine and motor protection relays** | **Protection relays for complex applications** |
| **Main standards and certifications** | | | |
| IEC | IEC, UKCA, UL, CSA, ANSI, EAC | IEC, UL, CSA, ANSI | IEC, UL, CSA, IACS, EAC (GOST), ANSI |
| **Motor voltage range** | | | |
| Medium voltage | Medium voltage | Medium voltage | Medium voltage |
| **Motor power range** | | | |
| > 500 kW | > 500 kW | > 500 kW | > 500 kW |
| **Application segments** | | | |
| | | | |
| **Motor control type** | | | |
| DOL, VSD (CT only, 40-70 Hz) | DOL, soft start, reverse speed, autotransformer | DOL, VSD (CT only, 40-70 Hz) | DOL, soft start, reverse speed, autotransformer |
| **Motor Management functions** | | | |
| • Applicable for both asynchronous and synchronous machines<br>• Includes differential protection function (87) and optimization of thermal image monitoring for machines | • Intuitive withdrawable design<br>• Built-in arc flash protection<br>• Advanced communications incl. IEC 61850, all redundancy modes<br>• Motor protection: overcurrent, directional ground fault, thermal overload, 2nd/5th harmonic detection, under/over voltage start-up supervision, emergency restart, under/over speed, anti-backspin and temperature monitoring. | • Applicable for both asynchronous and synchronous machines<br>• Includes differential protection function (87) and optimization of thermal image monitoring for machines | • Phase-to-ground and inter-turn fault protection<br>• Underload and overload protection<br>• Operating time<br>• Breaker failure<br>• Directional ground fault protection<br>• Directional active and reactive power<br>• Under/overvoltage<br>• Optimized thermal image, temperature monitoring<br>• Field loss<br>• Machine differential protection, Series 80<br>• Tripping context |
| **Motor Management benefits** | | | |
| • Compact (45 mm wide) for easy integration into motor starter functions<br>• Reduces production loss and associated downtime<br>• Simple setting and signaling features | • Adaptability to specific applications through programmable logic or advanced logic (IEC 61131 and IEC 61499 compliant)<br>• Extensive measurements for better understanding of network conditions<br>• Easier fault analysis with extensive monitoring and recording functions<br>• Proven cybersecurity acc. to IEC 62443 4-2 Security Level 1 | These relays not only improve monitoring conditions, but they also facilitate machine maintenance and save on wiring costs | • Redundancy and GOOSE messaging via IEC 61850 and Modbus TCP/IP simultaneously<br>• Adaptability to specific applications through logic equations editor or Logipam (ladder) Series 80<br>• Visualize the motor start report and motor trend record on the display and in COMTRADE format<br>• Programmable curve for ANSI 50/51 and ANSI 50N/51N<br>• SIL 2 certification |

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For typical motor characteristics: | Eff=0.96 | PF=0.88 |



D

## Switchboards and Motor Starters

| TeSys Power Deca Frame 2 | TeSys Power Deca Frame 3 | TeSys Power Deca Frame 4 | TeSys Power Giga | ComPact NS/NSX |
|---|---|---|---|---|
| GV2ME10 | GV3L65 | PB114914 | PB120280 | PB103208 - PB106360 |
| **Circuit breakers (GV2) for Deca contactors** | **Circuit breakers (GV3) for Deca contactors** | **Circuit breakers (GV4) for Deca contactors** | **Circuit breakers (GV5/GV6) for Giga contactors** | **Molded case circuit breakers** |
| **Main standards and certifications** | | | | |
| IEC/EN, CCC, UL, CSA, EAC, ATEX, BV, LROS, DNV-GL, RINA, UKCA | IEC/EN, CCC, UL, CSA, EAC, ATEX,BV, LROS, DNV-GL, ABS, UKCA | IEC/EN, UL, CSA, CCC, EAC, ATEX, BV, EU-RO MR, UKCA | IEC/EN, UL, CSA, CB, UKCA,UL, EAC, DNV-GL | IEC, EN, CCC, EAC (GOST), BV, LRS, DNV |
| **Motor voltage range** | | | | |
| 220... 690 V | 220... 690 V | 220... 690 V | 220... 690 V | 220... 690 V |
| **Motor power range** | | | | |
| ≤ 15 kW @ 400 V | ≤ 45 kW @ 400 V | ≤ 55 kW @ 400 V | ≤ 400 kW @ 690 V | 0.37…1,250 kW |
| **Application segments** | | | | |
| | | | | |
| **Motor control type** | | | | |
| DOL, reverse, star-delta, soft-start, VSD | DOL, star-delta, soft-start, VSD | DOL, star-delta, soft-start, VSD | DOL, star-delta, soft-start, VSD | DOL, soft start, VSD |
| **Motor Management functions** | | | | |
| • Up to 100kA<br>• About 100 auxiliaries and accessories<br>• High endurance<br>• Visible trip indication<br>• Patended Everlink connectors | • High breaking capacity Ics 100kA up to 32 A @ 400 V / 50 kA up to 80A @400 V<br>• Wide choice of auxiliaries / accessories<br>• Possible extended rotary handle<br>• Visible trip indication.<br>• Patended Everlink connectors<br>Direct monoblock starter assembly with TeSys Deca contactors. | • Compact and robust.<br>• Electronic core great detection accuracy<br>• Alarming and advanced protections GV4PEM, GV4PB. Magnetic, electronic thermal-magnetic, or electronic thermal magnetic with advanced protections versions.<br>• Up to 115 A 25 kA/400 V (B series),<br>50 kA/400 V (N series) or 100 kA/400 V (S series). | • Electronic protection against short-circuits, overload, phase loss and phase unbalance<br>• Adjustable overload and short-circuit current settings<br>• Field-selectable class of protection: Class 5, 10, 20<br>• 2 device motor starter solutions providing Type 1 & Type 2 coordination with TeSys contactors<br>• Built-in thermal memory<br>• Breaking capacity:<br>36 kA & 70 kA/ 400 V | • Flexible installation: any position; switchboard or wall-mounted<br>• Large range of electronic and thermal-magnetic protections<br>• Advanced trip unit with integrated power metering: I, U, P, E, THD, f, CosPhi<br>• Interchangeable trip units to upgrade your panel with smarter functions<br>• Embedded earth leakage protection (ELCB)<br>• Ensures motor protection (Type 1 & 2 coordination) |
| **Motor Management benefits** | | | | |
| • Easier to install and operate with multi-standard screws<br>• Safe and long-lasting power connection with EverLink terminals<br>• Digital customer experience for technical documents<br>• Maintenance guide via EcoStruxureTM Facility Expect | • Easier to install and operate with multi-standard screws<br>• Safe and long-lasting power connection with EverLink terminals<br>• Digital customer experience for technical documents<br>• Maintenance guide via EcoStruxureTM Facility Expect | Simple to specify, install and use for all applications<br>• Dual class to reduce commercial references<br>• Smartphone access to facilitate maintenance on site<br>Compact, space-saving design<br>• One-click accessories with spring terminal<br>• Externally visible auxiliaries<br>• EverLink technology ensures a lasting connection | • Wide choice of auxiliaries/accessories<br>• Suitable for multiple geographical locations<br>• Easy installation thanks to universal fixing with screws<br>• Highly reliable as the thermal elements include automatic compensation for ambient temperature variations<br>• Suitable for isolation, provides user protection | • Two standardized frame sizes<br>• Highly resistant to environmental stress<br>• Local and remote communication with trip alarm<br>• Easy to swap trip units and standardized accessories over time<br>• QR code for accessing information and support |

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*Certification depending on reference

For typical motor characteristics: | Eff=0.96 | PF=0.88 |

## Switchboards and Motor Starters

| TeSys GV5/GV6 | TeSys Control Ultra | TeSys Control Deca | TeSys Control Giga | TeSys Active Island |
|---|---|---|---|---|
| GV5P150H_ – GV6P500H | PB107380 | LC1D09BD | LC1G115BEEA | PB120863 |
| **Thermal-magnetic circuit breakers for motor protection and control** | **All-in-One motor starter** | **Contactors (LC1D) for motor control** | **Contactors (LC1G) for motor control** | **Digital multifunctional load management solution** |
| **Main standards and certifications** | | | | |
| IEC, UL, CSA, EAC (GOST) | IEC, UL, CSA, CCC, EAC(GOST), ASEFA, UKCA. ABS, BV, DNV, GL, LROS. ATEX. | IEC/EN, UL,, CSA, GB/T ,CCC, EAC, UKCA, CB certification, EU-MR-RO by DNV-GL | IEC/EN, UL,CSA, JIS, GB, CB scheme, CCC, cULus, UKCA, EAC,EU-RO-MR by DNV-GL | EN/IEC, UL, CSA, CCC, EAC,Achilles |
| **Motor voltage range** | | | | |
| 220... 690 V | 220... 690 V | ≤ 1,000 V | ≤ 1,000 V | 220... 400 V |
| **Motor power range** | | | | |
| 55…400 kW | ≤ 18.5kW @ 400 V | ≤ 75 kW @ 400 V | ≤ 450 kW @ 400~440 V | ≤ 37 kW |
| **Application segments** | | | | |
| | | | | |
| **Motor control type** | | | | |
| DOL, Star-delta, soft start, VSD | DOL, reverse, star-delta, soft-start, VSD | DOL, reverse, two speed, star-delta , soft-start, VSD | DOL, reverse, star-delta, soft-start, VSD | DOL, reverse , two speed, star-delta, sof-start, VSD |
| **Motor Management functions** | | | | |
| • Electronic protection against short-circuits, overload, phase loss and phase unbalance<br>• Adjustable overload and short-circuit current settings<br>• Field-selectable class of protection: Class 5, 10, 20<br>• 2 device motor starter solutions providing Type 1 & Type 2 coordination with TeSys contactors<br>• Built-in thermal memory<br>• Breaking capacity: 36 kA & 70 kA/ 400 V | • 3 ratings: 12, 32, 38 A (5.5, 15, 18.5 kW @ 400 V)<br>• Up to 50 kA @ 400 V<br>• Modularity principle<br>• Simplicity of choice<br>• Universal mounting<br>• Conventional projet design<br>• Electrically simple | • Controlled via AC, DC, low-consumption DC control circuit<br>• Connectors: Multi-standard screws, EverLink terminal block, spring terminal, ring-type connection<br>• Standard offer ready for harsh environments<br>• EverLink easy and safe mounting with circuit breaker | • Electronic control module<br>• Low power consumption<br>• Direct mounting and connection to TeSysGiga<br>• Control terminals push-in connection<br>• robustness and maintenance accessibility<br>• On-board diagnostics<br>• Compact size<br>• Replaceable switching modules<br>• Front accessible coils | • Up to 80 A (AC-3) / 37 kW/40 hp<br>• Availability of all relevant load data<br>• Simplified engineering and commissioning<br>• Up to 20 modules on 1 island<br>• Control and auxiliary full connectivity over fieldbus<br>• All adjustments and setting are digitized<br>• SIL starter available<br>• Embedded Cybersecurity (Achilles Level 2) |
| **Motor Management benefits** | | | | |
| • Wide choice of auxiliaries/ accessories<br>• Suitable for multiple geographical locations<br>• Easy installation thanks to universal fixing with screws<br>• Highly reliable as the thermal elements include automatic compensation for ambient temperature variations<br>• Suitable for isolation, provides user protection | • Simple to Maintain: Modular, plug & play structure<br>• Easy to Install and Use: Only one power base for all control units up to 38 A<br>• Efficient installation and wiring<br>• Flexible: Wire in the workshop, define the motor on site<br>• Compact: Save up to 57% of cabinet space<br>• Intelligent: Access to every motor detailed information<br>• Safe: Mirror contact as standard<br>• Advanced: Advanced motor management | • New modern look & feel of all machines<br>• Designed for Electro domestic and HVAC applications<br>• Easier to install and operate with multi-standard screws<br>• Improved fire resistance, and dustproof auxiliaries (IEC60335-1)<br>• Digital technical documents<br>• Maintenance guide via EcoStruxureTM Facility Expect<br>• Green range with consistent low consumption | • Easier selection<br>• Optimized installation<br>• Simplified maintenance<br>• Full-scale protection<br>• Maximized resilience and uptime<br>• Visible diagnostic indication<br>• Ready for critical applications<br>• Simpler connection | • Object-oriented functional approach<br>• simplifies application and system configuration<br>• reduces engineering tasks<br>• engineering and installation phase much faster<br>• can be easily integrated into 3rd party automation systems and supports several fieldbuses<br>• Access load data for advanced system diagnostics |

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For typical motor characteristics: | Eff=0.96 | PF=0.88 |

D

## Switchboards and Motor Starters

| BlokSeT PMCC/iPMCC | BlokSeT MB PMCC/iPMCC | Okken PMCC/iPMCC | Spacial SFM | Model 6 MCC/iMCC |
|---|---|---|---|---|
| PM105301 | PM105302 | PM105260 | PB502999 | PM105334 |
| **LV power distribution and motor control** | **LV power distribution and motor control** | **LV power distribution and motor control** | **LV power distribution and motor control** | **Distribution and motor control switchboard** |
| **Main standards and certifications** | | | | |
| IEC | IEC, DNV, GL, RINA, BV, CCS, ABS | IEC, DNV, RINA, BV, Shell DEP, EAC (GOST), CCC | IEC | NEMA, CSA, UL, ABS |
| **Motor voltage range** | | | | |
| 380…690 V | 440 or 690 V | 380…690 V | 415 V | 208…600 V |
| **Motor power range** | | | | |
| ≤ 250 kW | ≤ 250 kW | ≤ 250 kW | ≤ 250 kW | 0.25…300 kW<br>0.33…400 HP |
| **Application segments** | | | | |
| | | | | |
| **Motor control type** | | | | |
| DOL, VSD (standalone) | DOL, star-delta, reverse speed | DOL, VSD (standalone) | DOL, star-delta, reverse speed | DOL, star-delta (non-UL), reverse speed, etc. |
| **Motor Management functions** | | | | |
| • Fixed and withdrawable distribution and motor feeders | • Fixed and withdrawable distribution and motor feeders | • Fixed and withdrawable distribution and motor feeders | • Compartmentalized and pre-equipped enclosures<br>• Up to 4b form separation<br>• Up to 250kW motor feeders<br>• Complete, robust comprehensive, reliable for fixed MCCs: switchgear (short circuit protection devices, limiters, contactors, and thermal relays for classic MCC coordination type 2), switchboards as well as distribution (Linergy busbar system)<br>• IEC 61439-1&2 compliant | • Fixed and withdrawable distribution and motor feeders<br>• Closed Door racking<br>• Absence of voltage tester<br>• Thermal monitoring |
| **Motor Management benefits** | | | | |
| • IAC 85 kA/0.4 s<br>• Earthquake/seismic 2G<br>• Up to 34 DOL functional units in a single column<br>• EtherNet/IP embedded<br>• Recommended communication architecture with TVDA (32 units)<br>• Fast device replacement (FDR) | • IAC 65 kA/0.3 s @ 690 V<br>• Up to 8 DOL functional units in the fixed type column<br>• Up to 32 DOL functional units in the withdrawable type cubicle<br>• Fast device replacement (FDR) | • IAC 100 kA/0.5 s<br>• Earthquake/seismic 2.7G<br>• Up to 36 DOL functional units in a single column<br>• Recommended communication architecture with TVDA (32 units)<br>• EtherNet/IP embedded<br>• Fast device replacement (FDR) | • IAC 85 kA/1s<br>• Earthquake/seismic 3G<br>• 11 different compartment dimensions (from 3M to 24M)<br>• up to 36 modules for greater flexibility.<br>• Same framework as Spacial SF<br>• Quick, easy, and simplified assembly system<br>• Built-in partial doors and panels (IP54 - IK10)<br>• Side-by-side or back-to-back combination<br>• Connectable with Spacial SF and Spacial SFP by PrismaSeT HD (power distribution) | • IAC 100 kA/0.4 s<br>• Earthquake/seismic qualified<br>• Recommended communication architecture with TVDA<br>• EtherNet/IP embedded<br>• Fast device replacement (FDR) |

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For typical motor characteristics: | Eff=0.96 | PF=0.88 |

## Switchboards and Motor Starters

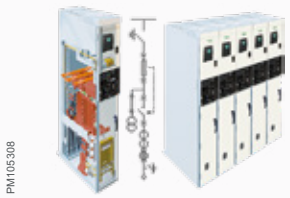
| EasyPact EXE | CBX | MCSet | PIX | PIX-MCC |
|---|---|---|---|---|
| PM106400 - PM106461 | PM103784 | PM105303 | PM105304 | PM105307 |
| **Vacuum circuit breaker** | **Vacuum contactor** | **MV primary distribution switchboard** | **MV primary distribution switchboard** | **MV motor control center** |
| **Main standards and certifications** | | | | |
| IEC | IEC | IEC, EAC (GOST)<br>BV, ABS, DNV, LR | IEC, EAC (GOST) | IEC, BV |
| **Motor voltage range** | | | | |
| ≤ 17.5 kV | 2.2…12 kV | 2.2…13.8 kV | 2.2…13.8 kV | 2.2…13.8 kV |
| **Motor power range** | | | | |
| ≤ 20,000 kW | ≤ 3,800 kW | Circuit breaker: ≤ 10,000 kW<br>Contactor: ≤ 2,300 kW | Circuit breaker: ≤ 10,000 kW<br>Contactor: ≤ 2,300 kW | ≤ 2,400 kW |
| **Application segments** | | | | |
| | | | | |
| **Motor control type** | | | | |
| DOL, soft start, VSD | DOL | DOL | DOL | DOL |
| **Motor Management functions** | | | | |
| • Fixed and withdrawable versions<br>• Up to 10,000 operating cycles with preventive maintenance<br>• A spring-operated mechanism to give the device an opening and closing speed that is independent of the operator | • Fixed contactor<br>• Up to 1,000,000 operating cycles, magnetically held, up to 300,000 with mechanical latch<br>• Up to 6 kA short-circuit breaking capacity<br>• Up to 6 kA @ 7.7 kV and 4 kA @ 12 kV short-circuit breaking capability | • Withdrawable circuit breaker or contactor<br>• LSC2B-PM<br>• Coupled to Motorpact<br>• LF circuit breaker (SF6)<br>• Evolis circuit breaker (vacuum)<br>• EasyPact EXE circuit breaker (vacuum)<br>• CTV1 contactor (7.2 kV vacuum)<br>• Rollarc R400 contactor (12 kV SF6) | • Withdrawable circuit breaker or contactor<br>• LSC2B-PM<br>• Coupled to PIX-MCC<br>• HVX circuit breaker (vacuum)<br>• CVX contactor (vacuum)<br>• Designed to meet O&G client specifications i.e. DEP Shell | • Compact single-tier fused vacuum contactor (CVX)<br>• LSC2B-PM<br>• Designed to meet O&G client specifications i.e. DEP Shell<br>• Suitable for motor, feeder, and capacitor switching |
| **Motor Management benefits** | | | | |
| • Remote control and enhanced safety features<br>• Suitable for motors in continuous processes<br>• Simplicity of use<br>• QR code for accessing information and support | • Can be adapted to be withdrawable<br>• Suitable for motors in frequent start-stop operations<br>• Reduced overvoltage during interruption of motor starting<br>• Robustness<br>• Simplicity of use<br>• Fast switching rate.<br>• Long mechanical life.<br>• Low power losses thanks to electronic auxiliary supply.<br>• Easy configuration and low consumption. | • IAC - AFLR 50 kA/1s<br>• Earthquake/seismic qualified<br>• Reduced maintenance and probability of failure: monitoring of temperature rise, indication of the fault zone<br>• Provided with VAMP arc detection<br>• Safety function: easy to use, safety interlock to prevent unauthorized operation | • IAC - AFLR 50 kA/1s<br>• Earthquake/seismic qualified<br>• Reduced maintenance and probability of failure: monitoring of temperature rise, indication of the fault zone<br>• Provided with VAMP arc detection<br>• Comprehensive interlocking, with all operations from the front<br>• Motorized withdrawal of the circuit breaker | • IAC - AFLR 50 kA/1 s<br>• Earthquake/seismic qualified<br>• Directly coupled to PIX switchboard<br>• Easy access to the main cabling at the front of the cubicle<br>• Space saving, 400 mm wide panel |

Mining Metals & Minerals Wastewater Oil and Gas Marine

For typical motor characteristics: | Eff=0.96 | PF=0.88 |

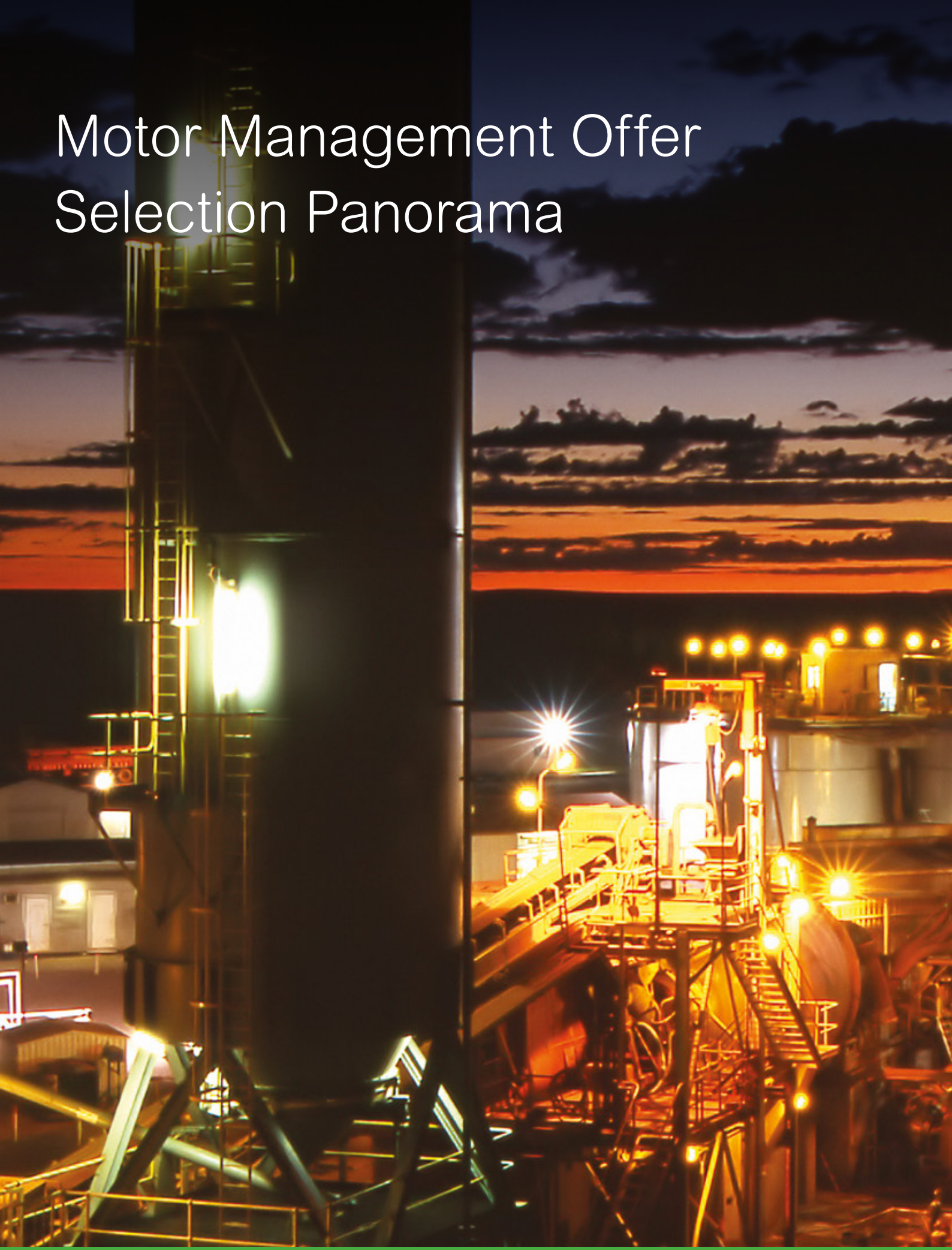
D

## Switchboards and Motor Starters

| Motorpact FVNR - 450 A | Motorpact FVNR - 720 A | SM6 |
|---|---|---|
|  PM105308 | PM105309 | PM103194 |
| **Full voltage motor starter** | **Full voltage motor starter** | **MV secondary distribution** |
| **Main standards and certifications** | | |
| IEC, NEMA, UL, DNV, BV, LR, ABS | NEMA, UL | IEC, EAC (GOST) |
| **Motor voltage range** | | |
| 2.2…7.2 kV | 2.2…7.2 kV | 2.2…13.8 kV |
| **Motor power range** | | |
| ≤ 4,200 kW<br>≤ 3,800 kw (Marine) | ≤ 6,800 kW | Circuit-breaker ≤ 10,000 kW<br>Contactor ≤ 2,300 kW |
| **Application segments** | | |
| | | |
| **Motor control type** | | |
| DOL, reverse speed, 2-speed | DOL | DOL |
| **Motor Management functions** | | |
| • Standalone or coupled to PIX/ MCset switchboard<br>• LSC2A-PI with line disconnector<br>• All operations from the front<br>• Controls and fully protects the motor with a protection relay<br>• Integrates a capacitor bank up to 450 kvar | • Standalone or coupled to PIX/ MCset switchboard<br>• LSC2A-PI with line disconnector<br>• All operations from the front<br>• Controls and fully protects the motor with a protection relay | • Fixed, disconnectable, or withdrawable metal-enclosed switchgear<br>• LSC2A-PI with line disconnector<br>• SF6 or vacuum technology circuit breakers<br>• switch-disconnector<br>• circuit breakers: SF1, SFset, Evolis<br>• Disconnector<br>• Motor starter contactor: CVM |
| **Motor Management benefits** | | |
| • IAC - AFLR 25 kA/1 s<br>• Reduced maintenance and probability of failure: monitoring of temperature rise, indication of the fault zone (MDT relay)<br>• Space saving (375 mm wide in DOL version)<br>• Simple use, comprehensive interlocking, with all operations from the front<br>• Local cost-effective reactive power compensation | • IAC - AFLR 25 kA/1 s<br>• Reduced maintenance and probability of failure: monitoring of temperature rise, indication of the fault zone (MDT relay) | • IAC - AFLR 16 kA/1 s<br>• Easy installation and maintenance<br>• Compact<br>• Standardized engineering<br>• Easy and safe to operate<br>• Easy extension |

D

# Motor Management Offer Selection Panorama



# Power Quality

Choosing the correct capacitor bank, harmonic mitigation system, or transformer will ensure correct operation of the motor in the process with minimum impact on the power supply system. 30 to 40% of business downtime is caused by power quality disturbances; 60% of motor failures are due to overheating, for which poor power quality is a common cause.


Power Factor Correction: Capacitor Banks.....p. 38
Harmonic Mitigation .....p. 38
Transformers (indoor & outdoor).....p. 39


E

## PFC: Capacitor Banks | Harmonic Mitigation

| PowerLogic PFC | BlokSeT DC | PowerLogic AccuSine PCS+ | PowerLogic AccuSine PCSn | EasyLogic APF |
|---|---|---|---|---|
| PM105276 | PM107034 | PM105282 | AccuSine_PCSn | EasyLogicAPF |
| **LV capacitor banks for polluted networks** | Integrated power factor correction | **LV active harmonic filters** | **LV active harmonic filters** | **LV active harmonic filters** |
| **Main standards and certifications** | | | | |
| IEC, CSA, UL | IEC | CE, C UL US (CSA), CNAS, RCM, EAC, RoHS, ABS, DNV-GL | CE, C UL US (CSA), RCM, EAC, ABS, DNV-GL | CE, RoHS, REACH |
| **Motor voltage range** | | | | |
| 230…690 V (50 Hz)<br>240…600 V (60 Hz) | 230…690 V | 380…690 V | 200…415 V | 380...415 V |
| **Power range** | | | | |
| 6…1,150 kvar | ≤ 540 kvar | 50…250 kvar @ 480 V (60…300 A) | 20...60 A @ 415 V | 50...150 A @ 400 V |
| **Application segments** | | | | |
| | | | | |
| **Motor Operation Type *** | | | | |
| DOL, VSD | DOL | VSD | VSD | VSD |
| **Motor Management functions** | | | | |
| • Reduces voltage drop during motor operation<br>• Fixed (individual motor or static loads) or automatic type (frequently started motors)<br>• Applicable in systems with THD <7%<br>• Avoids harmonic amplification | • Power factor compensation<br>• Fixed type correction<br>• For systems with THDi up to 7% | • Reduces voltage drop during motor start and operation<br>• Ultra-fast response at <2 cycles<br>• Corrective capability: THD(i) <3% and near unity displacement power factor | • Reduces voltage drop during motor start and operation<br>• Ultra-fast response at <2 cycles<br>• Corrective capability: THD(i) <3% and near unity displacement power factor | • Reduces voltage drop during motor start and operation<br>• Ultra-fast response at <2 cycles<br>• Corrective capability: THD(i) <5% and near unity displacement power factor |
| **Motor Management benefits** | | | | |
| • Reduced reactive energy billing penalties and operating expenses<br>• Improved power system and equipment reliability<br>• Improved active power capacity of the installation<br>• Reduced conductor cross-section (motor cable) when installed at the motor terminals<br>• Specially designed for networks containing harmonics | • Reduced reactive energy billing penalties<br>• Easy to install, integrated solution within switchboard<br>• Benefits from certifications and tests of the BlokSeT range | • Complies with harmonic standards worldwide<br>• Can be operated as a displacement power factor correction and load balancing device independent of or in conjunction with harmonic mitigation<br>• Maximizes uptime when used for harmonic and/or power factor correction<br>• Stops voltage sags and flicker due to load current fluctuations | • Complies with harmonic standards worldwide<br>• Can be operated as a displacement power factor correction and load balancing device independent of or in conjunction with harmonic mitigation<br>• Maximizes uptime when used for harmonic and/or power factor correction<br>• Stops voltage sags and flicker due to load current fluctuations | • 3 Level IGBT: reduce high-frequency filter inductance and implement modularity of APF<br>• Flexible mounting options<br>• Higher air exhaust ingress protection<br>• Enhanced safety with in-built EMC filter<br>• Ease of installation with cable glands |

Mining Metals & Minerals Wastewater Oil and Gas Marine

* Motor Operation Type
DOL = rated speed \ VSD = variable speed

# Transformers (indoor & outdoor)

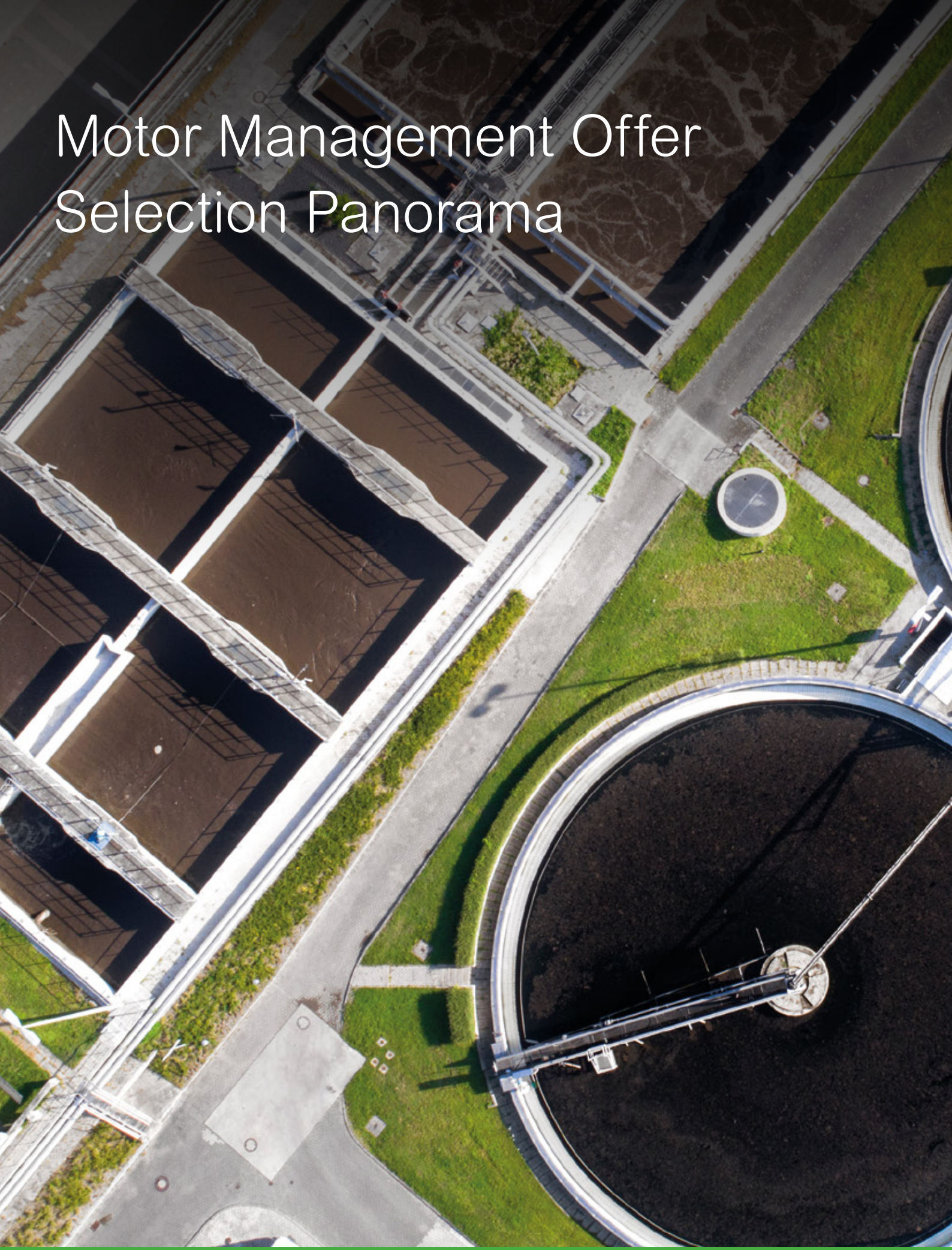
| Oil distribution transformers: Minera | Cast resin transformers: Trihal | Minera MP | Minera Ex | BC Imprego |
|---|---|---|---|---|
| PM105284 | PM105285 | PM105286 | PM105287 | PM105289 |
| **Floor-mounted distribution transformer** | **Cast resin dry-type transformer (including 12-pulse and step-up)** | **Medium power transformer (MPT)** | **Oil-type transformer for explosive atmosphere** | **Vacuum pressure impregnated transformer** |
| **Main standards and certifications** | | | | |
| IEC, ANSI, ABS, BS, AU | IEC, ANSI, ABS, BS, AU, GOST | IEC, ANSI, ABS, BS, AU | IEC, ANSI, ABS, BS, AU, DNV, BV, LR | IEC, ROHS, REACH, DNV, LLOYD'S, VERITAS, etc. |
| **Motor voltage range** | | | | |
| Primary: ≤ 52 kV<br>Secondary: ≤ 36 kV | Primary: ≤ 40.5 kV<br>Secondary: ≤ 36 kV | Primary: ≤ 170 kV<br>Secondary: ≤ 36 kV | Primary: LV ≤ 36 kV<br>Secondary: ≤ 36 kV | ≤ 12 kV |
| **Power range** | | | | |
| ≤ 3.15 MVA | ≤ 15 MVA | ≤ 100 MVA | ≤ 60 MVA | ≤ 5 MVA |
| **Application segments** | | | | |
| | | | | |
| **Motor Operation Type*** | | | | |
| DOL, VSD | DOL, VSD | DOL, VSD | DOL, VSD | VSD |
| **Motor Management functions** | | | | |
| • For MV/LV distribution<br>• Normal, low, or very low level of losses (Ecodesign)<br>• Cooling type: ONAN, ONAF, other on request<br>• Off-circuit tap changer or on-load tap changer<br>• Floor/Pole-mounted<br>• Hermetically sealed or breathing type<br>• Electrostatic screen between primary and secondary coils | • For HV/MV and MV/LV distribution<br>• Normal, low, or very low level of losses (Ecodesign)<br>• Cooling type: AN, AF, other on request<br>• On-load tap changer<br>• Electrostatic screen between primary and secondary coils<br>• Both windings are encapsulated in cast resin<br>• Preimpregnated foil winding on LV side<br>• H or F class insulation | • For HV/MV/LV transmission and distribution<br>• Normal, low, or very low level of losses (Ecodesign)<br>• Cooling type: ONAN, ONAF, other on request<br>• Off-circuit tap changer or on-load tap changer<br>• Floor-mounted, oil-immersed transformer<br>• Hermetically sealed or breathing type | • For HV/MV/LV transmission and distribution<br>• Normal, low, or very low level of losses (Ecodesign)<br>• Cooling type: ONAN, ONAF, other on request<br>• Off-circuit tap changer or on-load tap changer<br>• Floor-mounted<br>• Hermetically sealed or breathing type<br>• ATEX, IEC Ex certification for Explosive Areas (Zone 1 or Zone 2) | • Coupling option: Dd0Y11, Zig Zag, extended delta, Yd5y6, angle shifting (±15°)<br>• Ambient temperature range: up to 60°C<br>• Dry-type transformers<br>• Optional: one or more output windings connected to the rectifier |
| **Motor Management benefits** | | | | |
| • Specific electrical design to match customer requirements<br>• Low noise level<br>• Reduced risk of fault between windings<br>• Can be designed according to the harmonics present on the primary and secondary sides<br>• Minimum maintenance (oil analysis every 5 years)<br>• Anti-vibration design | • Can be designed according to the harmonics present on the primary and secondary sides<br>• Low noise level<br>• Reduced risk of fault between windings<br>• Easy installation and minimum maintenance<br>• Indoor and outdoor application<br>• Protected against fire hazards | • Specific electrical design to match customer requirements<br>• Low noise level<br>• Secured on-site process and operations<br>• Electrostatic screen between primary and secondary coils | • Specific electrical design to match customer requirements<br>• Secured on-site process and operations<br>• High reliability in critical applications<br>• Higher fire and flash points with Ester oils<br>• Environmentally friendly with biodegradable oil option | • Simple and reliable solution for harmonic reduction<br>• Avoids need for additional switchgear for connection to busbar<br>• Eliminates need for passive or active harmonic filter on large drives<br>• Galvanic insulation between network and drive |

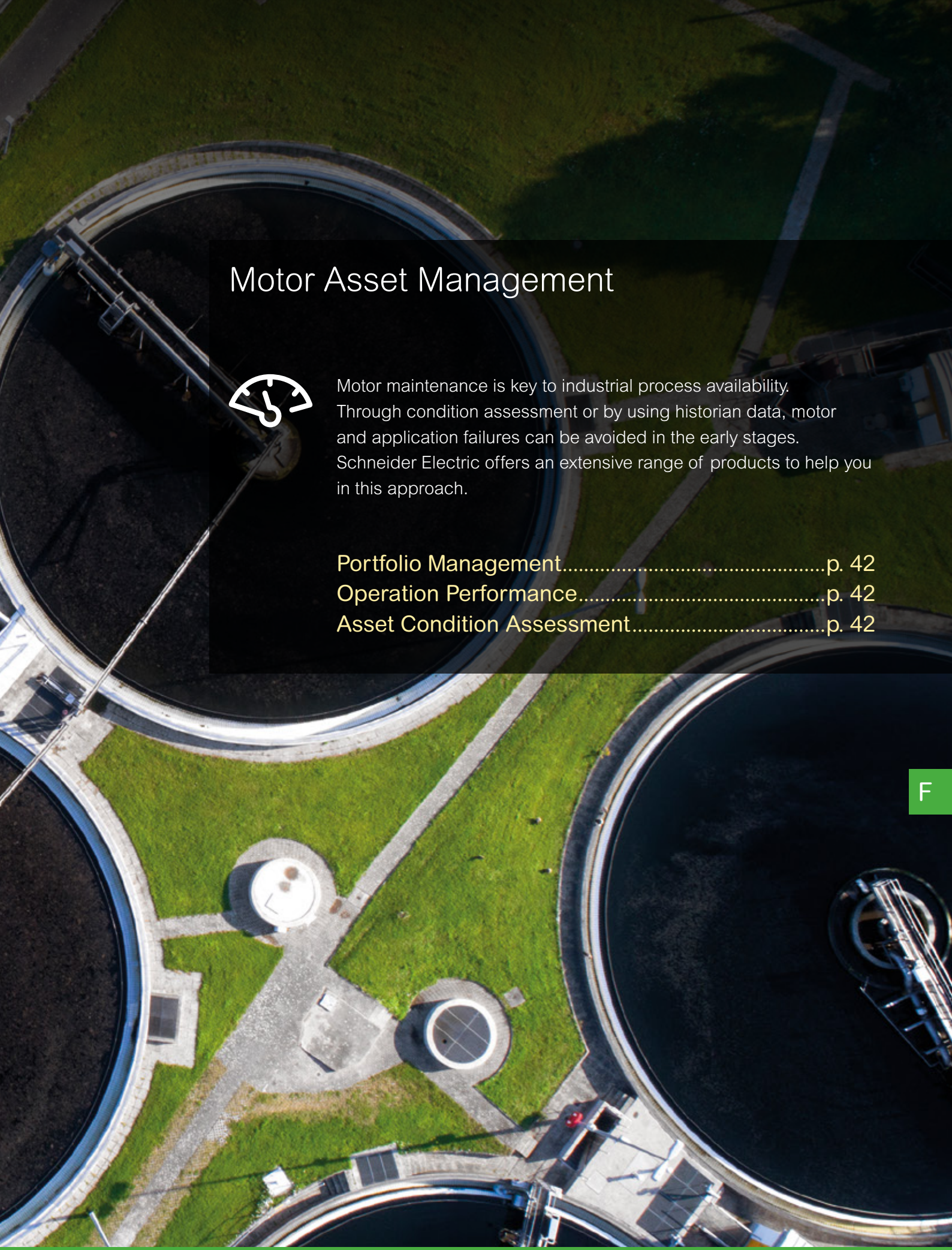
Mining Metals & Minerals  Wastewater  Oil and Gas  Marine

* Motor Operation Type
DOL = rated speed \ VSD = variable speed

E

# Motor Management Offer Selection Panorama





# Motor Asset Management

Motor maintenance is key to industrial process availability. Through condition assessment or by using historian data, motor and application failures can be avoided in the early stages. Schneider Electric offers an extensive range of products to help you in this approach.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Operation Performance.....p. 42
Asset Condition Assessment.....p. 42


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| Portfolio Mgmt. | Operation Performance | | Asset Condition Assessment | |
|---|---|---|---|---|
| EcoStruxure™ Maintenance Advisor | EcoStruxure™ Process Expert | EcoStruxure™ Power | EcoStruxure™ Asset Advisor | TeSys Active TeSys T |
| PM108385 | PM108386 | PM108387 | PM108388 | LTMR08EBD |
| Predictive Maintenance Software | Distributed Control System (DCS) for hybrid applications | Energy Management & Control System" Software based solution | Preventive and predictive maintenance | Intelligent Motor Management system |
| **Main standards and certifications** | | | | |
| N/A | IEC/EN, CE, CSA, EAC, GL | N/A | N/A | EU, CCC, Marine (BV, LROS, DNV, RINA, ABS) |
| **Application segments** | | | | |
| | | | | |
| **Motor Management functions** | | | | |
| • Condition monitoring<br>• Unified workspace to report health of all asset categories<br>• Clear and understandable asset alerts, with action recommendations<br>• Mobility and workflkow capability<br>• Integration with AVEVA IntelaTrac data collection from non-connected or stranded assets | • DCS functionality based on HMI/PLC<br>• Ethernet-based architectures<br>• Single environment for engineering, operation, and maintenance<br>• Integrated solution power & process for small and large industries | • Full Ethernet redundancy based on IEC 62439<br>• Electrical asset modeling based on IEC 61850 with TOP/DOWN engineering workflow<br>• On Line Condition Monitoring & service bureau<br>• Cybersecurity certification IEC 63443 | • On cloud platform<br>• Condition-based maintenance<br>• Motor Current Signature Analysis (MCSA)<br>• Analytics<br>• Smart alarms<br>• Dedicated Service Bureau Expert | • Covers all load monitoring and protection needs, from feeders to critical process automation<br>• Multiple industrial protocols: Modbus, Profibus, CANopen, DeviceNet, Modbus/TCP, and EtherNet/IP |
| **Motor Management benefits** | | | | |
| • Maximize operational uptime<br>• Minimize operation and maintenance costs<br>• Maximize workforce productivity and safety | • Simplified engineering, operation, and maintenance activities<br>• Reduced energy consumption and increased process efficiency | • Reduce planning risks and CAPEX<br>• Ensure people's safety and avoid electrical fire risks<br>• Avoid downtime<br>• Efficient operations/ peace of mind<br>• Optimize maintenance<br>• Optimize energy efficiency | • Prevent asset failure and reduce downtime<br>• Protect personnel<br>• Optimize maintenance scheduling<br>• Reduce maintenance costs | • Advanced motor protection from basic to mission-critical applications<br>• Warning of potential issues through intuitive pre-fault alarming<br>• Maximum flexibility with expandable I/O and custom-programmable logic |

Mining Metals & Minerals Wastewater Oil and Gas Marine

## Asset Condition Assessment

| MicroLogic | Sepam 40, Easergy Sepam 60 & 80 | MiCOM 10, 20, Easergy MiCOM 40 | Easergy P3 | PowerLogic P5 |
|---|---|---|---|---|
| PM107039 - PB104804 | PM105293 | PM105296 | PM106366 | PM106930 |
| **Electronic trip unit for ComPact NS/NSX circuit-breaker** | **Protection relays for industrial applications (motor protection)** | **Comprehensive protection relays** | **Protection relays** | **Withdrawable protection relays** |
| **Main standards and certifications** | | | | |
| IEC, ANSI, UL | IEC, UL, IEEE | IEC, UL, IEEE | IEC | IEC, UKCA, UL, CSA, ANSI, EAC |
| **Application segments** | | | | |
| | | | | |
| **Motor Management functions** | | | | |
| • Measurement of current, voltage, energy, power<br>• Communication through Ethernet and Modbus SL protocols<br>• Communication of settings | • Measurements: current, voltage, frequency, power, temperature, etc.<br>• Data logging<br>• Machine diagnosis: temperature rise, motor starting time, remaining operating time before overload tripping, waiting time after tripping, etc.<br>• Reports: motor start reports and motor start trends<br>• Network, switchgear, and self-diagnosis | • Measurements: current, voltage, frequency, power, etc.<br>• Event records are generated by status changes to logic inputs, outputs, settings, and alarms<br>• Readily available for viewing on the LCD display<br>• Fault records<br>• Disturbance records<br>• Oscillographic analysis using Easergy Studio software | • Measurements: voltage, current, power, energy, min/max values, harmonic THDi, THDv, voltage sags and swells<br>• Disturbance record | • Measurements: voltage, current, power, energy, min/max values, total harmonic distortion, voltage sags and swells<br>• Fault, event and disturbance recording<br>• Compatibility with thermal (TH110) and environmental sensors (CL110)<br>• Advanced circuit breaker monitoring |
| **Motor Management benefits** | | | | |
| • Integration in a power monitoring system | • Modularity, redundancy, and connection to accessories<br>• Communication via multiple protocols<br>• Adaptability to specific applications through logic equations editor | These relays not only improve monitoring conditions, but they also facilitate machine maintenance and save on wiring costs | • Communication via multiple protocols<br>• Modularity and redundancy | • Simplified architecture for switchgear condition monitoring<br>• Application flexibility with extensive logic capabilities<br>• Enhanced safety with arc-flash protection and nearby control<br>• Proven cybersecurity acc. to IEC 62443 4-2 Security Level 1 |

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Mining Metals & Minerals Wastewater Oil and Gas Marine

## Asset Condition Assessment

| PowerLogic PM5000 series | PowerLogic PM8000 series | PowerLogic ION 9000 |
|---|---|---|
| PM105317 | PM105318 | ION9000_w_RMD_screen |
| **Basic multi-function meter** | **Intermediate meter** | **Advanced power quality meter** |
| **Main standards and certifications** | | |
| IEC/EN, cUL, CE, EAC (GOST), RCM | IEC/EN, cUL, CE, RCM, EAC (GOST) | IEC/EN, cUL, CE, RCM |
| **Application segments** | | |
| | | |
| **Motor Management functions** | | |
| • Monitor control panels with basic metering power, amps, volts, harmonics, alarms, digital I/O<br>• Class 0.5S (PM55xx 0.2S) active energy accuracy<br>• Serial and Ethernet communications to tie into SCADA with Modbus/TCP and Modbus | • Monitor critical motors with energy and basic power quality metering<br>• Class 0.2S active energy accuracy<br>• Modular digital and analog I/O, and voltage sag/swell detection<br>• Programmable, including simple control functionality<br>• Multiple communication options | • Monitor the most critical motors with advanced power quality monitors<br>• On-board power quality compliance monitoring – EN50160, IEEE519<br>• Web-based motor derating curve<br>• Class 0.1S active energy accuracy<br>• Modular digital and analog I/O and display options<br>• Sag/swell and transient detection, disturbance direction detection, flicker<br>• Programmable, including simple control functionality (ION)<br>• Multiple communication options<br>• Cybersecurity event logging and hardening |
| **Motor Management benefits** | | |
| • Better understanding of operational costs driven by energy usage<br>• Alarm to warn of voltage unbalance and harmonic issues | • Better understanding of operational costs driven by energy usage<br>• Trending functionality to track usage and detect changes in energy use that may indicate maintenance issues<br>• Capture voltage sags that can cause contactor dropout (ITI-CBEMA plots)<br>• Determine if voltage problems originate from the utility company or from within the facility<br>• NEMA motor voltage unbalance derating curve | • Better understanding of operational costs driven by energy usage<br>• Trending functionality to track usage and detect changes in energy use that may indicate maintenance issues<br>• Capture voltage sags that can cause contactor dropout (ITI-CBEMA plots)<br>• Determine if voltage problems originate from the utility company or from within the facility<br>• Detect high-speed transients that cause premature aging (or failure) and motor malfunction<br>• Use high-speed meter inputs from drive trip signals to record voltage sags causing drive trips<br>• Timestamp status changes to within ±1 ms to understand the sequence of events for faster issue resolution |

Mining Metals & Minerals Wastewater Oil and Gas Marine

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# Motor Management Offer Selection Panorama

# More about Motor Management by Schneider Electric

Get further information about Motor Management approach developed by Schneider Electric.


Overview of EcoStruxure™ Power ..... p. 48
EcoStruxure™ Architecture in Motor Applications ..... p. 49
Motor Management approach and Challenges ... p. 50
Range of tools to upscale your awareness ..... p. 52


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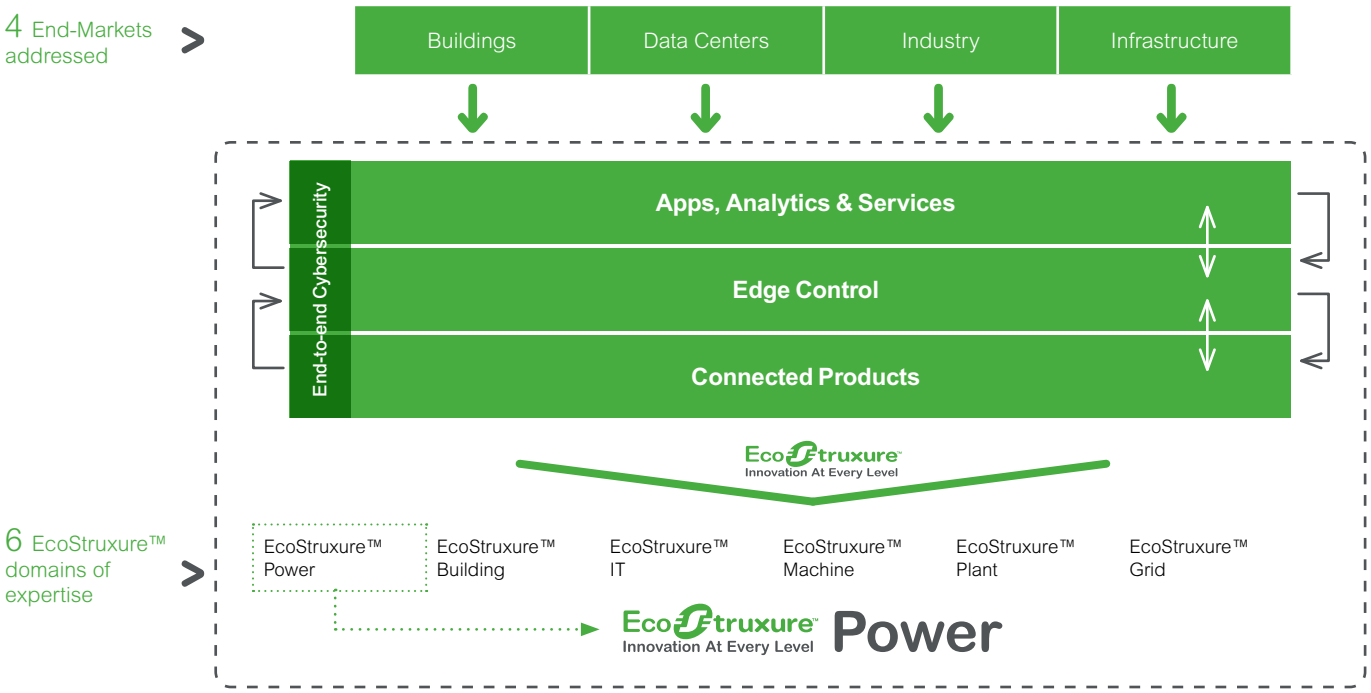
# Overview of EcoStruxure™ Power

## Introduction

At Schneider Electric, we envision a digital-electric world with zero electrical safety incidents, zero unplanned downtime, zero energy waste and zero cyber intrusions that impact operations. We are striving to make this vision a reality with EcoStruxure™ Power, our IoT-enabled architecture and platform, that enhances productivity, reduces risks and unlocks new growth opportunities.

At the core of EcoStruxure™ Power are three interwoven levels of innovation: connected products, edge control, apps, analytics and services. Continuously communicating in real-time in a cyber-secure environment, they give you complete visibility so you can optimize your network.




EcoStruxure™'s integrated architecture serves four End-Markets with its six domains of expertise.

In a world that is increasingly digital and electric, the ways to manage business are challenged:

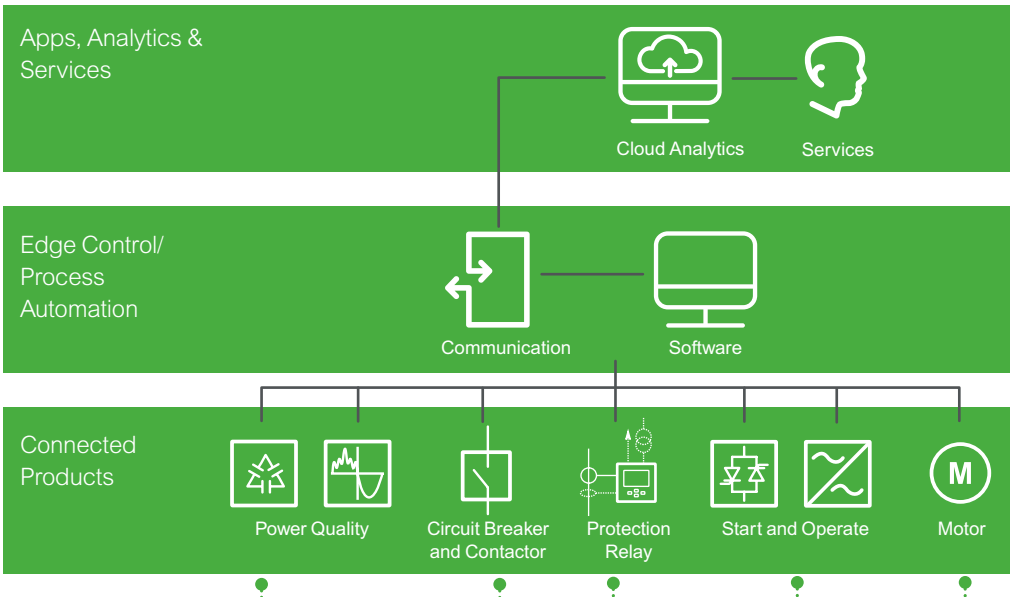
- Keeping staff and occupants safe is a priority that cannot be compromised
- Business Continuity is equally important, with power outages dramatically impacting profitability
- Environmentally-conscious public, customers and shareholders expect energy efficiency and sustainability initiatives
- Safeguarding intellectual property and data against cyber risks demands new level of vigilance

# EcoStruxure™ Architecture in Motor Applications

Go to:
EcoStruxure™ Power

Scan or click on QR code

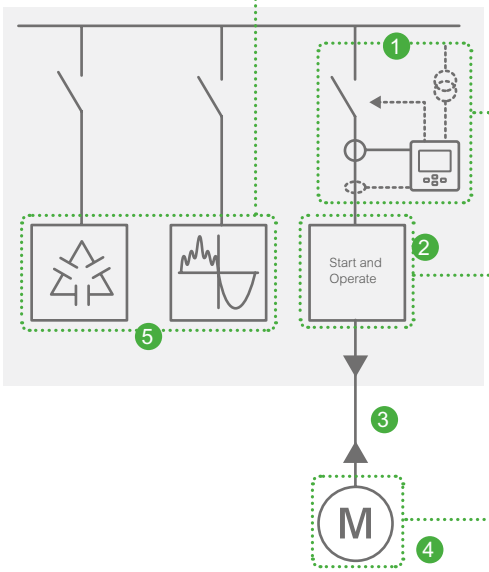
## Motor management is part of a complete industrial installation with 3 levels:




**Predictive maintenance and services,** based on cloud analytics, for proactive and preventive maintenance

**Process automation** and supervisory systems for local asset monitoring

**Connected Products,** to make data available for analysis




1. Circuit breakers and fused contactors associated with protection relays are typically used to connect, protect and start motors.
2. Soft starters or variable speed drives are used to start and operate motors by adapting the electrical and mechanical characteristics to the load and the network.
3. Cables are mainly sized according to the installation requirements. Their cross-section is defined by normal and fault currents. The control mode selection can influence cable sizing and bring optimization benefits.
4. Motors are essentially defined by application requirements. In high power ranges, their optimization can bring overall cost savings in terms of reactive power consumption, heat losses, upstream transformers and generator sizing.
5. Power quality concerns extra power consumption and financial penalties from utility or equipment malfunctioning. Motors affect power quality through their control mode.

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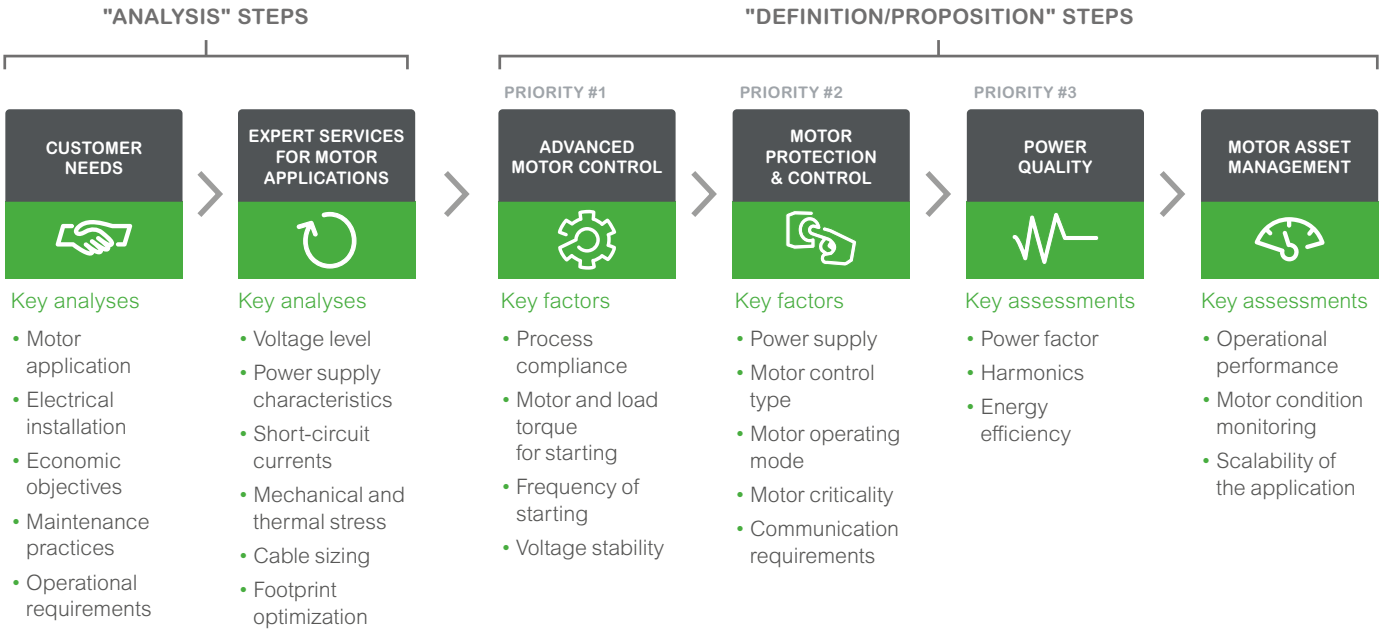
# Motor Management Approach




## How Can Motor Management Help Tackle the Challenges of Industries with LV and MV motors?

Electrical motor management is often associated with motor maintenance, but involves much more. It concerns multiple electrical, mechanical and maintenance challenges for end-users, designers and equipment manufacturers. With its extensive offer portfolio, competencies and know-how, Schneider Electric helps you for a sustainable motor integration in the electrical system and the industrial process.

### Electrical installation

- Maintain system voltage at acceptable level during start-up
- Control power factor and harmonics in normal operation
- Limit fault current contribution and impact on equipment sizing and cost

### Process and mechanics

- Define an adequate torque and speed control solution for the application
- Avoid premature aging by limiting the mechanical stress on start-up

### Maintenance

- Adapt maintenance actions to the specific motor characteristics
- Properly schedule maintenance operations
- Integrate preventive maintenance in the electrical installation from the design stage

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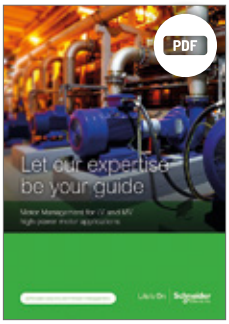
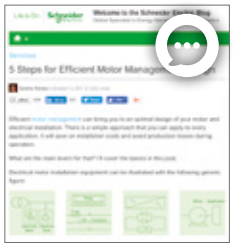
# A Range of Tools to Upscale your Motor Management Awareness

## To understand our Motor Management approach

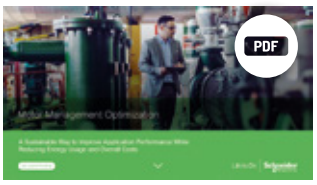



**Brochure**
"Motor Management for LV and MV high-power motor applications"
998-20034028_GMA-US



**Blog post**
"5 steps for efficient motor management design"

**E-Guide**
Process Industries

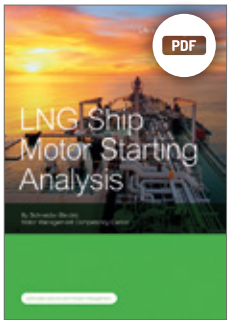



**Motor Management Optimization**
998-22140451_Motor management and sustainability_eGuide_GMA

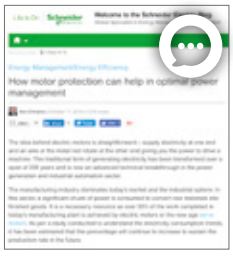
**Presentation**
Discover Motor Management approach in a short video.

## To know more about your key applications

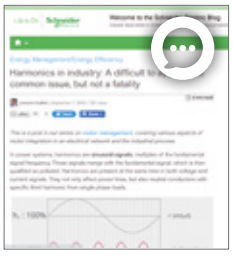
**Technical guide**
"Solving the LV vs MV Dilemma When Optimizing Costs for Motor Management"
998-20348705_GMA-US




**Case study**
"LNG Ship Motor Starting Analysis"
998-20231311_GMA-US



**Blog post**
"How motor protection can help in optimal power management"



**Blog post**
"Harmonics in industry: A difficult to apprehend common issue, but not a fatality"

**Blog post**
"3 safety measures for motors with individual power factor correction"

Video PDF Web Blog

## Dedicated experts to support your Motor Management approach

From analyzing your needs to proposing the most suitable technical solutions, the "Motor Management Competency Center" by Schneider Electric brings you true benefits in the design of LV and MV motor applications: in-depth technical analysis, impartial advice, optimization and simplification of the technical solutions, guaranted operation, and optimized total cost of ownership.

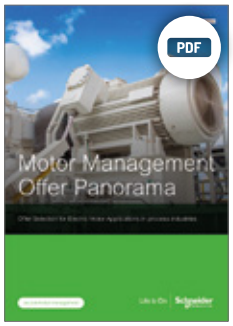
## To improve your technical background

**White paper**
"Three Steps for Reducing Total Cost of Ownership in Pumping Systems"
998-2095-02-19-14AR0_EN

**White paper**
"Modeling of Motor Starting Methods in EMTP-ATP"
998-2095-11-08-18AR0_EN

**White paper**
"A tool to optimize motor management: Benchmarking EcoStruxure Motor Management Design with ETAP"
998-22248800_Motor_Management

## To get an overview of our range of solutions




**Brochure**
"Motor Management Offer Panorama"
NRJED316712EN

**E-Guide**
Process Industries Section "Define Motor Management architecture"

## To design Motor Management applications

**Presentation**
Discover EcoStruxure™ Motor Management Design Web-App

**Presentation**
Discover EcoStruxure™ Motor Control Configurator

**Presentation**
Drive energy saving analysis using EcoStruxure™ Motor Management Design Web-App

**www.se.com**/motor-management

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# Motor Management Offer Selection Panorama

# Motor Management Glossary

This glossary explains all the technical terms and acronyms used in this Motor Management offer selection panorama.

Glossary .....p. 56

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## 2-speed Motors

Asynchronous motors can be built for 2 different speeds. This can be by means of a Dahlander arrangement, with a common point in the winding, where the ratio between the 2 speeds is always 2. Another method is to use 2 independent windings per phase, allowing any speed. In both cases one speed or the other is selected by changing the wiring of the windings. This will change the number of pole pairs.

## 4 Quadrants (4Q)

In motor control solutions using variable speed drives, 4-quadrant refers to the capability of the drive to reverse the power flow, for example, for cranes or downhill conveyors, where the load will temporarily transform the motor into a generator.

## Advanced Control

A means of control where there is a possibility of gradual starting/stopping and/or control of the speed.

## AFLR

Access Front Lateral Rear

## Asset Condition Assessment

The assessment consists of providing condition status, alarm, and diagnostic information for a particular asset, motor, generator, transformer, etc.

## Autotransformer

In a motor management context, an autotransformer is a power component used to transform the voltage applied to its primary side into a lower voltage, with a common connection between the primary and the secondary. It does not provide any galvanic isolation between the primary and secondary.

## Autotransformer Starters

This type of motor starter uses an autotransformer in order to start a motor in 3 steps:

- The motor power is supplied through the autotransformer at a reduced voltage compared to that of the network. The starting current and torque, as well as mechanical stress, are greatly reduced compared to a DOL start.
- After a predefined time, the starting point of the autotransformer is opened, changing it into a series inductance, supplying the motor with a voltage value between the autotransformer and the network voltage. This step provides a higher current and torque allowing the motor to continue to accelerate.
- Finally, the motor is connected directly to the line for the end of starting and continuous operation.

## Capacitor Banks

Power factor correction is important for the correct sizing of electrical network components (transformer, cables, etc.) and to avoid penalties on the energy bill. This correction is often achieved by connecting capacitors as a source of reactive energy. When the necessary reactive power is high and the network load is varying, it is necessary to arrange the capacitors in several banks that will be connected sequentially to provide only the required amount of compensation (automatic compensation).

## Capital Expenditure (CapEx)/Operational expenditure (OpEx)

- Capital expenditure encompasses all the expenses linked to the installation of an asset.
- Operational expenditure covers all the expenses linked to the operation of an asset. It represents 90% of the total cost of a motor.

## Control Systems

Device or set of devices, including software programs, used for controlling the industrial process or machines.

## Cooling Types (ONAN, ONAF, OFAF, OFWF, ODWF, ODAF, AN, AF)

Mainly used for transformers, this acronym indicates the type of cooling system used. 2 letters are used to represent a single cooling method and 4 letters are used if 2 methods exist, indicating either inside or outside the tank for oil-immersed transformers or normal or boosted modes for dry-type transformers.

- The first letter indicates the nature of the fluid: O = oil, A = air, W = water.
- The second letter indicates the type of circulation: N = natural convection, F = forced circulation, D = directed circulation.

## Distributed Control System (DCS)

System (hardware and software) used to control the process in continuous and hybrid process industries.

## Direct-On-Line (DOL)

The starting method is called direct-on-line when a motor is started by connecting it directly to the electrical network line through a contactor or circuit breaker without any other equipment in series with the stator or the rotor. This is one of the least expensive starting methods but it needs a large amount of energy from the electrical network and imposes mechanical and electrical stress on the motor.

## Drive Systems

Drive systems are customized variable speed drive (VSD) solutions, fully tested and ready to connect to the electrical network and industrial process.

## Energy Management and Control System (EMCS)

Energy management and control systems are used for controlling energy-consuming devices in order to minimize energy demand and consumption.

## Fast Device Replacement (FDR)

The capability to replace a configured device with a new one while keeping time and effort to a minimum in order to optimize system availability. The new device boots, is configured with the same parameters as the original device, then switches to operating mode.

## Harmonics/5th Harmonic

- Harmonics represent pollution or distortion in the form of the voltage and the current in industrial electrical systems. Harmonics are signals at frequencies which are multiples of the fundamental 50 or 60 Hz in industrial systems.
- The 5th harmonic is produced from the rectifier part of a 6-pulse variable speed drive. It is the highest harmonic in magnitude.

## Harmonic Mitigation

Solution for reducing the harmonic content in the electrical system (typically a filtering solution).

## Harmonic Voltage Factor

The harmonic voltage factor measures pollution of the voltage in the presence of harmonics (5th and above). It is used for determining derating of the motor. The HVF is typically below 2%, but for some motors it can be up to 3%.

## Human Machine Interface (HMI)

Usually comprises a keypad and a (touch) display.

## IAC

Internal Arc Classification.

## Insulated Gate Bipolar Transistor (IGBT)

Power electronic component used in the input and output stages of variable speed drives.

## LSC1/LSC2A/LSC2B(-PI/-PM)

Introduced in 2003 by the standard IEC 62271-200, it defines the loss of service continuity level of a switchboard when opening compartments (other than a busbar, in single busbar designs) as follows:

- LSC1: Other functional units or some of them can be disconnected
- LSC2A: All other functional units can be energized
- LSC2B: All other functional units and all cable compartments can be energized:
  - PI (Isolated Partition): with one or more non-metallic partitions and/or shutters
  - PM (Metallic Partition): with metallic partitions and/or shutters that are intended to be grounded

## MDT Relay

Temperature electronic module used for thermal diagnosis in MV switchboards by permanently monitoring the connection temperatures and reducing maintenance costs.

## Motor Control Center (MCC)/Intelligent Power & Motor Control Center (iPMCC)

A system integrating intelligent motor protection relays (iMCC) and intelligent circuit breakers (iPCC) in a functional installation system (i.e. switchboard, panel, etc.) providing connectivity to a DCS and/or SCADA through an industrial communications network.

## Off-Circuit Tap Changer (Off-Load Tap Changer)

The tap changer is used to modify the transformer ratio in a limited range, such as adapting to the variation in magnitude of the supply voltage. This adaptation is made with the transformer off-load.

## On-Load Tap Changer (OLTC)

A tap changer with the possibility to make the adaptation with the transformer on-load.

## Power Factor Correction (PFC)

The source (generator, transformer, etc.) is designed for a rated apparent power that is the sum of the active and reactive power. The power factor is the ratio of active power over apparent power. Power factor correction consists of limiting the reactive power the source has to deliver. The reactive power is provided by another source: capacitor banks.

## Programmable Logic Controller (PLC)

A device used in automation systems for controlling the industrial process or machines.

## Process Control

A device or set of devices controlling the industrial process or machines.

## Protection Relays

A protection relay continuously measures the electrical parameters of the equipment it protects, either directly, in low voltage, or through signal conditioners (current transformers and voltage transformers), in medium voltage. When a parameter passes a threshold set by the user, the relay issues an alarm or a trip signal. A trip signal is used to open the circuit breaker connecting the equipment to the network. Modern digital relays also offer metering of acquired and calculated signals, diagnosis of network and equipment, communication, and control-command possibilities.

## Reverse Speed

The rotation of the rotor in the opposite direction.

## Root Mean Square (RMS)

This is the constant characteristic of alternating current or voltage used for calculating the power dissipation in a load.

## Supervisory Control and Data Acquisition (SCADA)

Generic name for monitoring and control systems – used for energy or process control of customer installations.

## Slip-ring Motors/Winding Motors

Motors with a wound rotor that can be connected to an auxiliary power supply, or to starting resistor in order to reduce the current on starting and increase the torque.

## Soft starter (SS)/Reduced Voltage Soft Starter (RVSS)

Power electronics-based solution used for smoothing motor starting by controlling the current supplied to the motor, without modifying its frequency, in contrast to a variable speed drive.
For low voltage applications, the usual term is soft starter (SS), whereas reduced-voltage soft starter is used for medium voltage applications.

## Soft Stop

Smooth stopping of the motor, typically for soft-starter devices, by linearly reducing the supplied current. Reduces the mechanical stress on the load, very useful in pump applications.

## Star-Delta

Starting method used to reduce the startup current. Needs a motor with a delta arrangement designed for the voltage network. It is first connected to the line with a wye arrangement, being equivalent to a higher voltage motor supplied by a lower voltage. After a delay, the arrangement is changed to delta to finish acceleration and for normal operation.
Mainly used for low to medium power LV motors.

## Switchboard and Motor Starters

A switchboard is the point at which an incoming power supply divides into separate circuits, each of which is controlled and protected by the fuses or switchgear in the switchboard. Motor starters can be integrated in the switchboard, or connected to it in standalone configuration.

## Synchronous/Asynchronous Machine

In a rotating machine, there is one static part, typically called the stator, and another rotating part, called the rotor.

- In synchronous machines, the rotation speed is equal to the speed of the magnetic flux in the stator (i.e. they are synchronized) and to achieve this the rotor is also supplied with energy through a dedicated system.
- In asynchronous machines, the rotor is not supplied with power; it rotates at a speed close to but not equal to the speed of the magnetic flux, and the difference in the speeds is used to provide the energy necessary to make the rotor spin.

## Total Cost of Ownership (TCO)

Refers to the cost of the initial investment and operating costs from the purchase of the equipment to its end of life.

## Total Harmonic Distortion (THD/THDi)

- THD refers to the ratio of the square root of the sum of the square of the powers of all harmonic components to the power of the fundamental voltage.
- THDi is the same ratio applied to the current.

## Tested, Validated, and Documented Architecture (TVDA)

TVDAs are generic solutions supplying comprehensive system documentation, wiring diagrams, HMI application, and project templates that reduce the time required for design, installation, and commissioning.

## Torque Control System (TCS)

A patented principle for controlling motors using an LV soft starter, integrated in the ATS48 offer.

## Transformers

In a motor management context, a transformer is a power component used to transform the voltage applied to its primary side into another voltage, providing galvanic isolation between them. It can be either step-down, where the secondary voltage is lower than the primary, or step-up, where the opposite is true.

## Tripping Context

When a digital protection relay issues a trip command it can record several parameters, other than the one at the origin of the trip. These parameters, like currents, voltages, powers, and frequency, are saved together in a record. This record is called a tripping context record.

## Variable Speed Drive (VSD) / Variable Frequency Drive (VFD)

- VSDs are electronic power systems used to adapt the speed of an electric motor.
- VFDs are dedicated to AC asynchronous and synchronous motors where the speed is modified by changing the applied frequency.

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