#### **Power Xpert® CX** IEC Low Voltage Motor Control and Power Distribution Center

E.T.N



Withdrawable LV Motor Control and Power Distribution Center





# Powering Business Worldwide

Eaton delivers the power inside hundreds of products that are answering the demands of today's fast changing world.

We help our customers worldwide manage the power they need for buildings, aircraft, trucks, cars, machinery and entire businesses. And we do it in a way that consumes fewer resources.

## Next generation transportation

Eaton is driving the development of new technologies – from hybrid drivetrains and emission control systems to advanced engine components – that reduce fuel consumption and emissions in trucks and cars.

#### Higher expectations

We continue to expand our aerospace solutions and services to meet the needs of new aviation platforms, including the high-flying light jet and very light jet markets.

#### Building on our strengths

Our hydraulics business combines localized service and support with an innovative portfolio of fluid power solutions to answer the needs of global infrastructure projects, including locks, canals and dams.

#### Powering Greener Buildings and Businesses

Eaton's Electrical Sector is a leading provider of power quality, distribution and control solutions that increase energy efficiency and improve power quality, safety and reliability. Our solutions offer a growing portfolio of "green" products and services, such as energy audits and real-time energy consumption monitoring. Eaton's Uninterruptible Power Supplies (UPS), variable-speed drives and lighting controls help conserve energy and increase efficiency.

# Switchgear Technology is in our DNA

Eaton's knowledge and understanding of industries, applications, technology, and products enables us to offer customers safe, reliable, and high performance solutions.

We have always been part of the creation of new Low and Medium Voltage Switchgear technology, and that experience is in each and every one of us.

## Eaton's Low Voltage Systems can meet the needs of any installation

Eaton Low Voltage Systems are designed to be as space and energy efficient as possible while maintaining easy access for installation, operation and maintenance. Low Voltage Systems from Eaton are highly standardized systems supported by quick configurations, quoting facilities, and fast deliveries.

Eaton's comprehensive low voltage system product portfolio has been specifically designed to meet the needs of all types of installations. The extensive portfolio includes: Power Supply and Control Assemblies), Package Substations, Main and Sub-Main Switchboards, Busbar Trunking, Motor Control Centres, Power Factor Correction, and Engineered Assemblies.

As might be expected from such a comprehensive portfolio, Eaton's low voltage power distribution and control systems have been used in applications, such as: Water industries, Pharmaceutical industries, Industrial facilities, Food & Beverage, Infrastructure projects, Mining & Steel industry and Commercial applications such as: Shops, Schools, Hospitals, Warehouses, Hotels, Prisons, Data centers, and Sport stadiums.

#### Reliable, safe and standardized design

Eaton's range of low voltage systems not only provides you with optimum power distribution and motor control functionalities, they meet your most demanding requirements for safety and flexibility. When it comes to safety, Eaton's low voltage systems offer the highest level of protection.

It is Eaton's policy that all products are subjected to rigorous testing and verification programs by, or under the supervision of, internationally recognized and respected third party organizations including: KEMA, ASTA, LOVAG and UL (Underwriters Laboratories). In addition to third party performance and quality verification many Eaton low voltage systems hold specialist approvals from: DNV, Lloyds, UL and KEMA.



# CX Withdrawable LV Motor Control and Power Distribution Center



The Power Xpert<sup>®</sup> CX is Eaton's latest IEC withdrawable low voltage switchgear up to 4000 A. The system provides reliable motor control and power distribution functionality for all industrial and commercial installations.

The innovative design combined with Eaton's expertise in the area of low voltage applications brings a new platform that is the heart of any motor control or power distribution environment. CX is a compact, ergonomic and flexible system.

The new system incorporates features like an unique, innovative and patented mechanical test position mechanism allowing the control circuits to be tested with both incoming and outgoing power terminals disconnected. A coloured indicator shows from a distance the position of the withdrawable unit and the IP integrity IP3X is not compromised when the unit is in the test position.

CX is a reliable solution for applications where the supply of energy is vital for your business process. Providing Form of Separation to form 3b and 4b, the withdrawable units can be exchanged without having to disconnect power and / or control cabling.

CX is verified by testing according to IEC EN 61439-2 guaranteeing maximum operational and personnel safety. Moreover, the system has been designed and tested in accordance with IEC/TR 61641: the guide for testing under conditions of arcing due to internal fault. Tests were performed with regards to the criteria for protection of personnel.

Eaton is known in the low voltage segment for reliable product families like Capitole, Tabula, Gemini, A300, xEnergy and Modan.

More than a century of designing and manufacturing low voltage systems comes together in the CX. This experience and expertise was used to develop a new generation of MCCs: CX.

To provide a fully integrated and tested solution, Eaton has used their state of the art switching and distribution components within the CX platform. Eaton's reputation in the industry is built on the legacy of brands like Cutler-Hammer, Westinghouse, Holec, MEM and Moeller.

CX is manufactured in Eaton facilities all across the world. With the local knowledge backed up with a multinational diversified industrial organization and experience, Eaton can offer a comprehensive service tailored to customer requirements, ranging from consultancy, engineering to total project management.

CX offers a state of art solution with functionality for Motor Control and Power Distribution in a single low voltage platform.

### Complete range up to 4000 A

CX is a complete range for motor control and power distribution up to 4000 A. In combination with Eaton's medium voltage switchgear, UPS (Uninterruptible Power Supplies), Busbar Trunking, Panelboards, Distribution Boards and project management & service capabilities, CX is part of any complete turn-key solution for all power distribution and control applications.

#### Application areas

The innovative design makes the CX system especially suitable for applications where the delivery of electrical energy is business critical:

- Water Industries
- Pharmaceutical Industries
- Industrial Facilities
- Food & Beverage
- Infrastructure
- Pulp & Paper
- Mining Industries
- Steel Industries









# **Features and Benefits**

#### **Reliable in Operation**

- Complete product design third party certified in accordance with IEC 61439-2 (Verified by testing).
- Designed and tested according to IEC / TR 61641 criteria 1-5.
- Quality assurance in accordance with DIN EN 9001 / ISO 9001.
- Routine tested in ISO certified manufacturing locations.
- External degree of protection is third party tested up to IP55 according to the IEC 60529.
- Internal protection for open compartments is at minimum IP2XB.
- Full internal separation of all functional units designed in accordance with Form 3b and an option for 4b.
- Compartments for withdrawable units can be modified without the need for full shut-down and power off.
- Interlocking mechanism to ensure safe Operating / Disconnected / Test positions.

#### Safe in Operation

- Units can be withdrawn safely from the system. This enables safe modification and easy and convenient exchange of units in a live situation.
- Automatic door interlocking of all outgoing feeder sections prevents access or removal when the switch is in the ON position.
- Defined drawer position indicator for test and disconnected positions
- Safety due to use of standardized IEC tested and certified Eaton components which have a proven track record.
- Distribution busbars are protected to IP2X when the drawer is removed. An optional Automatic Shutter Mechanism can be mounted to provide additional safety.
- Padlock facilities are available on all operating and interlock mechanisms.
- 3-point-lock system is standard on all cableway doors to ensure maximum safety.

#### System Flexibility

- Modular Design
- Small footprint
- Variable widths for cableways
- Easy to upgrade and extend the switchboard
- Suitable for universal use as the dimensions are according to the main industrial standards (DIN VDE, CEI, UNE, NF and BSEN)
- Cable connection from top and / or bottom
- Suitable for cable and busbar trunking main incoming connections
- Corner cubicles allow for flexible line-ups in the switch room using minimum space
- Withdrawable units with Motor Control and Distribution functionality integrated in one type tested system

#### **Total Cost of Ownership**

- Up to 25 drawers of 75 mm (15 kW or 63 A rating) can be installed in one column to reduce footprint and achieve maximum density.
- For the withdrawable sections, the distribution busbars are rated at 1000 A and 2000 A up to 80 kA / 1 s allowing a high density of outgoing units to reduce the total footprint of the installation.
- All parts are accessible from the front so rear can be placed adjacent to the wall.
- Compartments can be quickly and easily changed to ensure maximized Up-Time of your business process.
- Cable connection to withdrawable units can be accomplished under live conditions
- The use of high-grade materials and components, reduces maintenance to a minimum
- Systematic use of maintenance free joints that are tightened to optimum torques in our factory. Inspections or re-tightening of the electrical main connections is not required.
- Robust design of the withdrawable units with a minimum number of parts (routine tested in factory)

#### **User Friendly**

- "Slide and Guide" design enables optimal compartment alignment and ease of insertion and withdrawal.
- Ergonomical design of the switchboard provides easy and clear understanding of functionality.
- Intuitive withdrawal mechanics of the compartments allows for easy and safe compartment insertion and withdrawal.
- Simple operator interface with passive safety features allow for safe operation.
- Cable connection and user interface for operation on the same side of the switchboard. This way, no mistakes can be made due to visual conflicts.
- Withdrawable units can be quickly and easily exchanged without having to disconnect any power or control cabling.



# **Basic design**

The CX system is modular in construction. It is a self supporting sheetsteel structure, consisting of structure profiles and sheet-steel side walls and covers. The CX panels have three major sections:

1. The busbar section Section located at the rear of the structure where the horizontal and vertical busbars are located. 2. The cabling section Section located in a separate fully segregated cable chamber housing both control and power cable terminations

**3. The equipment section** Section at the front where the withdrawable functional units are fitted. The system is designed for 'front cable access' applications where the panels can be placed adjacent to a rear wall.

Alternatively the system can be placed in the middle of a switch room, either as a 'single line of structures' giving all around access to panels and cabling or as a 'back to back' arrangement.



#### Motor Control and Distribution Panels (example)

- 1. Withdrawable Unit
- 2. Main Incoming Feeder Unit
- Flushed key lockable door handles
- 4. Mounting Plinth
- 5. Outgoing Cable Connection Compartment
- 6. Auxiliary Control Voltage Busbar
- 7. Control Circuit Terminal Block - can be shrouded to provide Form 4b form of separation
- 8. Main Power Terminal Block can be shrouded to provide Form 4b form of separation

## Panel Structure

#### CX panels are frame-based sheetsteel structures that are self-supporting.

The doors, frames and the side and top plates are all made of sheetsteel. The outer sidewalls, back plate and all

front covers are epoxy coated. Corrosion-resistant zinc coated sheet-steel plates are used for the inner walls and for compartment separation.

The standard colour of the CX is RAL 7035 but other colours are available on request.

Structure	tructure Material					
Frame	2 mm sheetsteel	RAL 7035				
Doors	2 mm sheetsteel epoxy coated	RAL 7035				
Side plate	1.5 mm sheetsteel	RAL 7035				
Top plate	1.5 mm sheetsteel	RAL 7035				
Back plate	1.5 mm sheetsteel zinc coated	RAL 7035				

## Main Busbar System

The CX main busbars are arranged in a separate compartment in the rear of cubicle. This ensures maximum distance between the busbars and the operator and maintenance personnel. It can be placed either in the top-rear or bottom-rear position.

The main busbar system is fully separated from the equipment and cable compartments. The busbars are rated up to 4000 A - 100 kA / 1 s.

On site extension of the main busbar system can be easily

Maximum permissible

load current

1600 A

2000 A

2500 A

3200 A

4000 A

Ratings and cross-sections of available main busbars

**Busbar cross section** 

Phases / N

2 x 40 x 10 mm

2 x 60 x 10 mm

2 x 80 x 10 mm

3 x 80 x 10 mm

3 x 80 x 10 mm

and guickly accomplished with the appropriate busbar coupling clamps; no additional drilling is required.

The material specification of the busbars is: EN 13601-Cu-ETP-R250.

PE / PEN

1 x 40 x 10 mm

1 x 60 x 10 mm

1 x 80 x 10 mm

2 x 60 x 10 mm

2 x 80 x 10 mm

#### Earth busbars

Earth busbars are located in the main busbar compartment. Vertical branches from the main earth bar are fitted in the distribution and motor control cubicles where a full length earth bar runs in the cable compartment.

Short circuit capacity

lpk . 143 kA

143 kA

176 kA

176 kA

220 kA



Side view busbar section

lcw

65 kA - 1 s

65 kA - 1 s

80 kA - 1 s

80 kA - 1 s

100 kA - 1 s





Depth 800 mm up to 4000 A

# **Distribution Busbar System**

For cubicles with outgoing withdrawable units, vertical busbars are rated at 1000 A and 2000 A and up to 80 kA / 1 s allowing a high density of outgoing units to reduce the total footprint of the installation.

A protective shield which covers the entire height of the bar system, guarantees a level of protection IP2x against accidental direct contact when the drawer has been removed and when the door is open. An automatic shutter mechanism can be fitted as an option to increase this level of protection.

#### Switchgear and controlgear compartments for withdrawable units



IP2x shielding of the vertical busbar **1**, the outgoing contacts **2**, and auxiliary contacts **3**.



As an option the level of safety can be increased by adding an automatic shutter () that totally shields the empty functional unit from the busbar area.

## Draw out units

The outgoing units are available in the following heights based on a 75 mm height pitch:

Height of unit	Motor Starter	Feeder			
75 mm	15 kW	32 A			
150 mm	45 kW	175 A			
225 mm	75 kW	200 A			
300 mm	90 kW	225 A			
450 mm	160 kW	400 A			
600 mm	200 kW	630 A			
750 mm	250 kW	NA			

The units connect directly to the distribution bars and can be additionally protected by an optional automatic shutter. The design of the unit enables auxiliary components to be located in an optimized way because of the innovative use of Eaton's patented DIN Mounting Rail. This allows for maximum usage of the compartment space, enabling a very easy and flexible way to upgrade or make additions to the withdrawable units. The cable connections for main and auxiliary circuits are accessible through the cableway in either a Form 3b or 4b separation solution.

All the withdrawable units are available for distribution and motor control functionality. Up to 25 drawers of 75 mm can be installed in one panel to reduce footprint and maximize density.



Front view of a withdrawable motor starter unit up to 15 kW (75 mm).



Rear view of a withdrawable motor starter unit up to 15 kW (75 mm).

## Cable connection

# Front cable access for feeders greater than 630 A

With incoming and outgoing feeder panels in excess of 630 A, the main current cables are directly connected to the incoming or outgoing unit. For parallel cables, a cable connector set is available.

#### Cable-entry compartment for feeders less than 630 A

If several incoming and outgoing feeder sections are mounted in one cubicle, a separate, lockable cable-entry compartment is provided.

The standard cable compartment is 400 mm wide (a 600 mm wide cable compartment is also available where large numbers or sizes of cables need to be accommodated). The compartment is full height and is always positioned at the right hand side of the equipment compartment The compartment is provided with an undrilled, removable gland plate at the bottom of the cubicle. A vertical earth bar runs along the height of the cable compartment and is connected to the main system earth bar

Cable support strips are available for cable. Cable connections to each withdrawable unit are made in the cable compartment. The cable connections for main and auxiliary circuits are accessible through the cableway in either a Form 3b or 4b separation solution. Main incoming power connections can accommodate cables and or busbar trunking systems. These can be connected from the top or bottom. They are available for all network types.

Parallel busbar routing without a lateral overlap allows the exchange of individual sections in the assembly. The system can be expanded easily at any time. Two independent main busbar systems offer a wide range of different circuit options.

## Form of Internal Separation

CX panels are designed around three different areas:

- 1. The busbar section located at the rear of the structure where the horizontal and vertical busbar are located.
- 2. The cabling section located in a separate fully segregated cable chamber housing both control and power cable terminations.
- 3. The equipment section at the front where the withdrawable functional units are fitted.

IP2X

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IEC 61439-2 defines the various forms of internal separation. The form of internal separation determines how busbars, functional units and terminals are separated from each other. CX is designed to provide separation in both Form 3b and 4b solutions.

Form 3b and 4b are defined as: the separation of the busbars from each functional unit and the separation of each functional unit from each other.

The difference between Form 3b and Form 4b is based on how the terminals for outgoing conductors are separated from each other.

Form 3b solution is defined as: the separation of terminals for external conductors from the functional units, but not from those of other functional units. i.e. a common cable chamber where all outgoing terminals are grouped together.

Form 4b solution is defined as: the separation of the terminals for external conductors associated with a functional unit from those of any other functional unit and the busbars. i.e individual separation of each functional units outgoing terminals from each other.

#### Internal separation in accordance with IEC 61439-2



## **External Degree of Protection**



# Design philosophy of MCC Withdrawable units



#### Type 2 Coordination

The International Electrotechnical Commission (IEC) developed short circuit performance criteria for contactors and motor starters called Type 1 and Type 2 coordination. This standard defines motor controller protection levels following a short circuit fault.

Performance, levels - either Type 1 or Type 2 coordination are determined by the level of damage to components within a motor controller after a short circuit fault on the outgoing

side of the controller. The combination of a motor controller (contactor or starter) and short circuit protective device (manual motor protector, circuit breaker or fuse) must meet the following criteria as specified by IEC 60947-4-1.

Motor controllers with Type 1 coordination protection level are allowed to have significant damage after a short circuit and may not be suitable for further service without repair and replacement of parts.

Type 2 coordination protection provides confidence that the motor control components will be operable following a short circuit fault. This reusability translates into huge savings due to reduced downtime and replacement costs.

CX motor control units are designed and tested to provide Type 2 protection in the entire system thus ensuring the highest uptime during its lifetime.

# Unique Mechanical Test Position of MCC Withdrawable Units



**Connected position - ON** 



The withdrawable units in CX are designed around safety, ease of operation using Eaton's patented mechanical test position, ergonomic design and flexibility. These units can be easily exchanged without having to disconnect any power or control cabling.



**Test position** 

Test button is illuminated and colour blue visible.

The following positions are available for each unit:

#### Connected position

- Connected - ON The unit is inserted, main disconnect is closed, main and control circuit is connected

- Connected OFF The unit is inserted, main disconnect is open, main and control circuits are connected, padlocking is possible.
- **Test position** The unit is partially withdrawn and is separated 30 mm from the distribution bars, main disconnect is open, main circuit is disconnected, control circuit is connected, the test button is illuminated, padlocking is possible.

- **Disconnected position** The unit is partially
  - withdrawn and is separated 45 mm from the distribution bars, main disconnect is open, main and control circuits are disconnected, padlocking is possible
  - **Removed unit** The unit is completely withdrawn from the motor control center and the optional dummy unit can be inserted.

When the unit is in the "ON" position, the mechanical test position mechanism is interlocked with the operating shaft of the main disconnect device (MCP) to ensure that the compartment can not be withdrawn.



**Disconnected position** Colours green and blue are visible.

All positions are also clearly marked on the drawer position indicator strip with the blue (test) and green (disconnect) colours for extra visual aid.

The units are fully withdrawable without using tools and the different positions of withdrawable parts (connected, test, isolated and removed) will be achieved in accordance with table 103 of IEC 61439-2.

The degree of protection in the test and isolation position shall be at least IP3X. This allows the operator to leave the compartments in the panel when in the various positions without impacting the integrity of the complete system.

# **Reliable and Safe in Operation**



## Complete design certified in accordance with IEC 61439-2.

Eaton's proven technologies have been integrated in the design and development of the latest generation CX switchgear in order to ensure the complete system quality, safety and reliability. Experience and knowledge gained over more than 100 years in the field of low voltage distribution and motor control have been implemented.

The system has been verified by testing:

- IEC 604391: Type Tested Assembly - TTA.
- IEC 61439 verification by test.
- Components meet the requirements of IEC 60947-1 and related series of specific component standards.
- Operator safety has been central in the design philosophy of the system. CX is designed and tested to the criteria for personnel protection as described in IEC/TR 61641. The CX assemblies have been tested with optional arc mitigation features to improve safety performance under arcing conditions.

In addition to the stringent type test requirements laid down in the IEC61439 standard, CX is subjected to a full range of routine tests and a thorough quality control regime.

#### Quality assurance in accordance with DIN EN 9001 / ISO9001 with routine tests carried out in ISO 9001 certified Eaton manufacturing locations

Various routine tests are carried out during the production of the system. To assure quality, all processes are in accordance with DIN EN 9001. This means that at every stage of manufacture and production, the cubicles and the components; circuit-breakers, control components, current transformers and logic components are all inspected and tested in accordance with their own specific IEC standard and for correct operation.

When the entire installation has been assembled, a thorough visual inspection is carried out, together with mechanical, functional, and electrical checks.

#### Compartments for drawout units can be modified without process interruption

The design of the withdrawable unit offers optimum personnel protection and rapid interchangeability of the functional units without having to isolate the entire system. This means that module replacements and additions to the system require the minimum downtime. This enables safe and convenient modification and exchange under energized conditions.

#### Interlocked mechanism to ensure safe operating / disconnected / test positions

The withdrawable units in CX are designed around safety and ease of use with ergonomic design and flexibility. These units can be easily exchanged without having to disconnect power or control cabling. Withdrawable units come standard supplied with a standard test position for secondary circuit testing. The unit has a unique and patented mechanical test position mechanism.

#### Safety due to use of standardized components which have a proven track record

CX uses standard Eaton components, offering a wide range of motor starter ranges and applications. The experience and proven track record of these components like PKZ, PKE and DIL make the CX the system you can rely on.

As a standard CX is completely finger proof (IPXXB) - even with the compartment doors open or a withdrawable unit removed. For additional safety an optional shutter mechanism can be installed.

#### Eaton's Arc Fault Protection System ARCON<sup>®</sup> can be installed as an option

Eaton's patented Arc Fault Protection System ARCON® provides the highest level of safety for personnel and system. The system effectively limits the arc energy and discharges accidental arcing in less than 2 ms. After remedying errors and replacing the discharge device, the system is ready for continued service.

#### CX complies with the DIN dimension sizes for low voltage structures and many other industry standards

CX is suitable for universal use according to the main industrial standards (DIN VDE, CEI, UNE, NF, BSEN).

# Main components for distribution and MCC

The low voltage system in your network can be compared to the engine and breaks in a car. If that is not reliable the car doesn't function properly. In the same way the components used in the switchgear determine the reliability of the system.

A system is only as strong as it's weakest link and so the

quality of the individual components used determines the performance and quality of the system as a whole.

CX uses only the best components in the design of the structure and in the functional units. Eaton power switching and protection components are among the best in the world. Eaton delivers CX with Eaton's Air Circuit Breaker (ACB) and Moulded Case Circuit Breaker (MCCB) functionality.

Understanding the interaction of each individual component and how they operate within a complete system is essential to delivering a fully type tested, reliable and efficient power distribution and motor control application. All the critical components used in CX are Eaton components. Ranging from the Main Incoming Feeders to the pushbuttons and indication lights all the components come from Eaton.

## ACB functionality





#### Eaton type Magnum and NRX Air Circuit Breakers

- Tested according the IEC 60947-2Ranging up to
- 4000 A 100 kA / 1 s
- Comprehensive and innovative electronic Digitrip trip unit range (LSIG)
- Fixed and withdrawable mounting
- Complete with extensive range of accessories
- ARMS<sup>™</sup> system (Arcflash Reduction Maintenance System)

### MCCB and MCP functionality



## Eaton type NZM Moulded Case Circuit Breakers

- Only 4 frame sizes cover up to 1600 A - 100 kA
- Tested according to IEC 60947-2
- Innovative switching technology with a double break contact system speeds up the switching process
- Universal and modular accessories
- Wide range of diagnostics and communication features



#### Eaton type PKZ and PKE Motor Protective Circuit Breakers

- Only 2 variants for PKZ to cover the entire range from 0.1 to 65 A.
- PKE enables a wide range of electronically-controlled settings
- Common range of accessories for PKE and PKZ
- No need for additional current limiters

### Motor Control functionality







#### Eaton type DILM Contactors

- Tested according IEC 60947-2
- For a complete range of motorstarter types like Directon-line (DOL), Forward-Reverse and Star Delta
- Type 2 co-ordination motor starter combination with PKZ, PKE and NZM circuit breakers

# **Intelligent Motor Control Center**

To acquire the necessary level of operational information for appropriate management and control of the facility, optimum integration between process and electrical controls is indispensable.

CX integrates Intelligent Motor Control Systems (IMCS) that provide comprehensive data and opportunities to further optimize equipment performance, efficiency and productivity.

The IMCS handles all motor protection and control functions, communicates operational, diagnostic and statistical data, and organizes the communication between automation systems and motor feeders - providing both intelligent motor management and future-oriented energy management. The advantages of an Intelligent MCC are:

- Less downtime
- Less expensive (less DCS I/O, relays and wires)
- Reduced cost of ownership (engineering, testing, commissioning, fault finding)
- Broad functionality is available (e.g. energy measurement)
- Broad data is available (e.g. for predictive maintenance)
- Better authorization
- Open system
- Proven technology (large installed base)



# Eaton Air Circuit Breakers equipped with Arcflash Reduction Maintenance System<sup>™</sup> (ARMS)



Personnel safety is of paramount importance in today's work environment. Of recent concern is the potential for serious injury due to exposure to electrical arcs. There has been significant research performed and recent standards have been written to address the risks of arc flash hazards for personnel working on or near energized electrical equipment.

An Eaton air circuit breaker equipped with ARMS can improve safety by providing a simple and reliable method to reduce fault clearing time. The ARMS is controlled by a lockable switch that can easily activate a separate analog circuit for faster tripping time at the work location and be incorporated into a Lock Out Tag Out (LOTO) procedure. Equipment downstream of a circuit breaker equipped with an Arcflash Reduction Maintenance System can have a significantly lower incident energy level, thus protecting operators or maintenance personnel who are working on a downstream energized piece of equipment.

Benefits of Arcflash Reduction Maintenance System<sup>™</sup> are:

- Increased personnel safety by limiting the available arc flash energy.
- Simple to operate.
- Enabled with the circuit breaker door closed by a door mounted lockable switch or through communication to the breakers trip unit
- Enabled only for the time required to perform the work.
- Preserves overcurrent coordination under normal conditions.

# System flexibility

#### Modular design and small footprint

Any number of withdrawable compartment arrangements can be made. Motor Control and Distribution functionality is integrated within the one panel. A withdrawable motor starter or MCCB feeder unit can be placed in the same structure. CX is a compact system where up to 25 compartments of 75 mm can be installed in one column to reduce footprint and have maximum density.

## Variable widths for cable compartments

Generous sized cable ways are available for top and bottom cable entry. For the with-

drawable units the cabling compartments are 400 or 600 mm wide.

## Easy to upgrade and extend the switchboard

The switchgear can be extended to both sides whenever this is required. So when the demands for the switchgear change it can be upgraded and panels can be added with minimal process interruptions.

#### Suitable for cable and busbar connections

CX is designed for flexible customer connection methods: whether cables or busbar trunking systems.



#### Corner cubicles to allow for flexible line-ups to suit the switch room

Switch rooms come in many dimensions and that is why the CX is able to be manufactured in various flexible shapes with the help of corner cubicles. L-shape, U-shape or back-toback setups are available to fit the switch room lay-out.

# Total cost of ownership



#### **High Density stacking**

For the withdrawable sections the distribution busbars are rated at 1000 A and 2000 A up to 80 kA / 1 s allowing a high density of outgoing units to reduce the total footprint of the installations. Up to 25 withdrawable units with 15 kW can be populated per panel.

#### Compartments can be quickly and easily modified if necessary

Processes change and so does the need for motor control and power distribution. The CX is designed to be flexible when the units need to be upgraded or modified. This can all be done quickly and with minimum modifications to maximize up-time for your business process. The cable connection to drawout units can be carried out under live conditions so there are no interruptions.

#### Reliable system design

The use of high-grade materials and components reduces maintenance to a minimum. Due to the systematic use of maintenance free joints, factory tightened to optimum torques, inspections or retightening of the electrical main connections is not required. The CX has a robust design with a minimum number of parts. In addition, the complete platform is certified to the highest degree and every system is routine tested in our factories.

# **User Friendly**

#### Slide and Guide design for optimal compartment quidance

The CX is equipped with the slide and guide design for the withdrawable units to allow for reliable moving in and out of the compartments. For the operator this means that all the units will connect to the vertical busbars as intended.

## Ergonomical and intuitive design of the system

All compartments of the CX are designed in such a way that the system is safe and easy to operate. The use of an ergonomical, smooth and smart design prevents operators in the area of the switchgear to be injured (from moving parts or parts that stick out of the unit) or by wrong operation. The front panel is included with all the important functions that an operator needs for safe and efficient operation of a system.

#### Cable connection and user interfaces for operation on the same side of the system

To prevent mistakes in cabling, switching or other operations, the connection and interfacing with the CX is always on the same side on every panel.

#### Withdrawable units can be easily exchanged without having to disconnect any power or control cabling

If the withdrawable units are for the same function they can easily be exchanged with each other without major process interruptions because of (dis)connecting any cables. This capability potentially reduces the inventory of spare withdrawable units for a system.

# Options





Corner cubicles.



200 mm.



Busbar trunking connection (The XP system brings the design of low impedance, sandwich construction busbar trunking to a new superior level. The XP Trunking System is available in ratings from 500 - 6300 A).



Shutters in withdrawable units.



Measuring Equipment.



Dummy drawers for closing off empty compartments.



Power Factor Correction Equipment.



#### Other available options are:

- Surge Protection Device (SPD)
- Anti-condensation heating facility
- Project specific Synoptic diagram

# Sustainability

# The quality of Eaton's ideas, products and solutions is visible by the way they are designed and produced.

That is how we define sustainability - an attitude that has characterized our business principle and determined the way we think for nearly 100 years. Developing sustainable business practices is not only critical to the future of our company, but also for the benefit of future generations. Sustainability includes not only the environment, but also broader issues like health and safety of employees and local and global communities. Eaton's sustainability initiatives focus on all these aspects and are leading Eaton to sustainable growth, both profitably and responsibly.

Eaton is a pioneer in this regard within our industry sector. The product plant of Eaton in Hengelo (Netherlands) acts entirely in accordance with the rules and procedures of the ISO 14001 environmental certificate during the development and production processes. Our solutions help customers reduce their energy costs - and shrink the size of their carbon footprint - through our portfolio of energy efficient products. The CX MCC is designed to have a reduced environmental footprint, be safe and less labor intensive during installation. This makes the CX sustainable through its entire life cycle.



#### Life Cycle Assessment



Figure 1: Stages Analyzed in a Life Cycle Assessment

Life cycle assessment (also known as LCA, Life Cycle Analysis and Eco-balance Study) is a scientific method used to quantify the environmental impacts of a product or process from cradle to grave. As shown in Figure 1, Life Cycle Assessment takes into account the product's full life cycle from the extraction of resources, production, consumption and recycling up to the disposal of remaining waste. Because of the ability of a LCA to profile so many interrelated functions and assess them cumulatively as well as individually, it is possible to accurately quantify impacts in all phases and across various impact categories.

As the focus on environmental performance intensifies, companies will be increasingly expected to demonstrate proven results for their products. To understand and substantiate the environmental benefits of the CX product line, Eaton has been pro-active in commissioning a full life cycle assessment (LCA) study of the product. The detailed LCA study which has passed third party critical review step is ISO 14044 compliant. The results are presented in Table 1.

The CX design and development teams have followed a Life Cycle Thinking approach which seeks to identify possible improvements to goods and services in the form of lower environmental impacts and reduced use of resources across all life cycle stages. The key aim of Life Cycle Thinking is to avoid burden shifting. This means avoiding shifting of impacts from one stage of the life cycle to another; from one geographic region to another; or from one impact category to another. For example, saving energy during the use phase of a product, while not increasing the amount of material needed to deliver the savings.

#### Table 1: CX LCA Characterization Results Using Impact 2002+ Method

Damage	Unit	Total	Production	Distribution	Use	EOL
Human health	DALY	0.012	4.18 %	0.40 %	95.39 %	0.02 %
Ecosystem quality	PDF*m <sup>2</sup> *yr	2,554.33	15.04 %	6.90 %	78.01 %	0.04 %
Climate change	kg CO <sup>2</sup> eq	20,902.40	1.16 %	0.00 %	98.80 %	0.02 %
Resources	MJ	433,939.28	0.93 %	0.08 %	98.98 %	0.01 %

#### Low End of Life (EOL) Disposal Cost

#### Full Recycling or Reuse of Materials

CX has an expected lifetime of at least 30 years. Depending on the location where the system is installed, the lifetime could be extended. At the end of life and at the time of decommissioning Eaton can be contacted for the safe and efficient removal of the CX. All materials and components used in the system can be decommissioned, demounted and sorted for either recycling or reuse.



#### Application Flexibility and Safety

Process changes, for example the up rating of motor power or exchanging of compartments, may require on-site modification of motor starter circuits and accordingly, enlargement or reconfiguration of compartments. The CX design is able to meet these requirements under live conditions.

In cubicles with a vertical distribution busbar system, screening plates provide isolation from live parts allowing for the safe modification or exchange of compartments. The distribution bars allow for the connection of contacts along its entire length thus allowing for the modification of outgoing compartment sizes to be safely carried out under live conditions.

Compartment separation plates are secured by two bolts at the front of the cubicle. The separation plates can be easily and quickly removed and secured in a different location to create a new compartment layout and size.

# Eaton - A global company with local presence

Eaton is one of the leading technology corporations for over a century. Today Eaton serves customers in electrical, hydraulics, aerospace, truck and automotive markets.

What customers expect nowadays is new impetus in the quality and availability of services. Eaton offers the most comprehensive customer orientation in the market, thanks to the commitment of its local sales and service staff and its presence as a globally positioned organization with more than 70,000 employees as well as sales and distribution activities in over 150 countries around the world. And Eaton has strengthened its local presence around the world considerably. The strong position is due in part to the integration of the acquired companies' local sales forces as well as massive partner network expansion. "Combining local presence with the resources of a global brand allows us to provide partners and end customers with all the local support they require".

During the last few years, Eaton has strengthened its local presence around the world considerably. The strong position is due in part to the integration of the acquired companies' local sales forces as well as massive partner network expansion. "Combining local presence with the resources of a global brand allows Eaton to provide partners and end customers with all the local support they require".

Capitole, Modan, xEnergy and Tabula are household names in the electrical industry. With a large installed base worldwide and the expertise and experience that comes with it, Eaton has developed a new Low Voltage Motor Control and Power Distribution product: CX. A new generation that brings a state of the art system that completely complies with the latest standards, environmental thoughts, ergonomics and user interfacing needs.

Personal contact plays a crucial role between people despite automated logistics and global availability. This direct connection with customers, their requirements and challenges, is indispensable. That is why Eaton offers efficient service at a local level throughout the world.



CX is available anywhere in the world - whether it is the nearby industrial area, one of the world's industry centers, or an impassable desert region.

Whether it is the main incomer, the contactor or the pushbutton in the compartments, everything comes from the same source: Eaton. That is why CX is designed to meet the best standards in product technology with local service and support.

# Customers of Eaton benefit from a worldwide network of excellence

## **Electrical Data**

System	Power Xpert <sup>®</sup> CX					
Rated operational voltage	380 - 480 V					
Rated frequency	50 / 60 Hz					
Main busbar data						
Rated insulation voltage	1000 V					
Rated impulse withstand voltage	12 kV					
Rated current	1600 - 4000 A					
Rated short-time withstand current	50 - 100 kA / 1 s					
Rated peak withstand current	220 kA					
Vertical distribution busbar data						
Rated insulation voltage	1000 V					
Rated impulse withstand voltage	12 kV					
Rated current	1000 - 2000 A					
Rated short-time withstand current	35 - 80 / kA 1 s					
Rated peak withstand current	176 kA					
Enclosure data						
Degree of protection	IP31 / IP55					
Form of separation	Form 3b / Form 4b					
Entry of cables	Top and / or bottom					
Access	Front					
Standard Colour	RAL 7035					

## Dimensions (mm)

## Standards

# Power Xpert® CX complies with the following international standards IEC 61439-1 General rules

IEC 61439-2	Power switchgear and controlgear assemblies
IEC 60947-1	Low Voltage Switchgear and Control gear - Part 1: General rules
IEC 60947-2	Low Voltage Switchgear and Control gear - Part 2: Circuit Breakers
IEC 60947-4-1	Low Voltage Switchgear and Control gear - Part 4-1: Contactors and motor-starters
IEC 60529	Degrees of protection (IP Code)



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There's a certain energy at Eaton. It's the power of uniting some of the world's most respected names to build a brand you can trust to meet every power management need. The energy created supports our commitment to powering business worldwide.

From power distribution to power quality and control, Eaton allows you to proactively manage your complete power system by providing electrical solutions that make your applications safer, more reliable, and highly efficient. Visit www.eaton.com/electrical.

Eaton's Electrical Sector is a global leader in power distribution, power quality, control and automation, and monitoring products. When combined with Eaton's full-scale engineering services, these products provide customerdriven PowerChain™ solutions to serve the power system needs of the data center, industrial, institutional, public sector, utility, commercial, residential, IT, mission critical, alternative energy and OEM markets worldwide.

PowerChain<sup>™</sup> solutions help enterprises achieve sustainable and competitive advantages through proactive management of the power system as a strategic, integrated asset throughout its life cycle, resulting in enhanced safety, greater reliability and energy efficiency. For more information, visit www.eaton.com/electrical.

#### Eaton low voltage products in the energy chain





1 Capitole 20



2 Power Xpert<sup>®</sup> CX



3 Capitole 40

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