Eaton Roadshow

March 7th – July 1st, 2011
Programme

Presentation (30 minutes)
• Eaton
• Application in the distribution network
• Core technologies
• MV switchgear
• LV switchgear
• Integrated solutions

Questions & Answers (15 minutes)

Demonstration (30 minutes)
Eaton Worldwide

- Founded in 1911 by J.O. Eaton
- Chairman and CEO – Alexander M. Cutler
- World Headquarters in Cleveland, Ohio
- EMEA Headquarters in Morges, Switzerland
- Customers in more than 150 countries
- Approx. 70,000 employees worldwide
- 55% of sales outside the U.S.
Application in the distribution network

- Power plants
- Main stations
- Distribution substations
- Heavy industry
- Infrastructure
- Green energy
- Commercial buildings
- Shops and offices
- Residential applications
- Solutions and Services
- Power generation
- Process industry
- Industry
- Transformer stations
- Green energy
- Residential applications
- Solutions and Services
Eaton Core Technologies (1)

Solid insulation using cast resin technology

Features
• Environmental friendly isolation
• Robust construction
• Cooling purpose

Electrical field control

Features
• Reliable construction
• Air insulated compartment
• Compact design
Eaton Core Technologies (2)

Vacuum technology

Features
- Safe, compact & reliable construction
- None affected contacts
- Environmental friendly switching medium
- 30,000 operations
Application Knowledge

Features
- Flexible tailor made solutions
- Understanding and active member of the IEC committees and standards
- Fully tested systems (verified by 3rd party)

Eaton Inside

Features
- Air Circuit Breakers
- Moulded Case Circuit Breakers
- Fuse Combination Switches
- Motor Protective Devices
- Contactors etc.
Smart LV & MV Solutions

Features

• Eaton series of energy meters
• Eaton Automatic Transfer System
• Eaton Link to DCS Systems (Clink)
• SCADA, PLC, Software programming

Total Solution Provider

Features

• Project Management
• Project Engineering
• Installation and testing
• Integration of LV + MV + Automation
Medium Voltage Systems
Xiria

IEC medium voltage Ring Main Unit up to 24 kV

Features & Benefits

• Visible safety
• SF₆-free design
• Maintenance-free
• Suitable for automated networks
• Compact
• Easy cable connections
Applications

- Utilities
- Commercial buildings
- Industry
- Infrastructure
- Wind farms
## Technical data

<table>
<thead>
<tr>
<th></th>
<th>kV</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage</td>
<td>12</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Power frequency withstand voltage</td>
<td>28</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Impulse withstand voltage</td>
<td>75 / 95</td>
<td>125</td>
<td></td>
</tr>
<tr>
<td>Rated current busbars</td>
<td>630</td>
<td>630</td>
<td></td>
</tr>
<tr>
<td>Short-time current</td>
<td>20</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>* optional 3 s kA-1s*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circuit-breakers</td>
<td>200/500</td>
<td>200/500</td>
<td></td>
</tr>
<tr>
<td>Load break switches</td>
<td>630</td>
<td>630</td>
<td></td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP 31D</td>
<td>IP 31D</td>
<td></td>
</tr>
<tr>
<td>Classification according to IEC 62271-200:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss of service continuity</td>
<td>LSC 2B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partition class</td>
<td>PM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal arc</td>
<td>IAC AFL 20/16kA-1s</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Dimensions**
- Minimal floor space
- Low building costs
- Easy to install
- 2, 3, 4 or 5 panels

Dimensions:
- 600 mm
- 760 mm (2 panels)
- 1110 mm (3 panels)
- 1460 mm (4 panels)
- 1810 mm (5 panels)

1305 mm
Xiria

Innovation

- Xiria – MA with integrated tariff metering
- Integrated arc absorber
- New protection relay WIB1, with improved earth fault settings
Innovation

• New short circuit & earth fault indication
  • Horstmann Compass directional indication via WEGA 1.2C
  • Including 4 programmable relay contacts
  • Current transformers around the cable
  • Alternative for Amp meter
  • No Voltage transformers required
Power Xpert® FMX

IEC Medium Voltage Switchgear up to 24 kV

Features & Benefits

- Compact
- “Green” design (SF₆ free)
- High operation safety
- Maintenance free
- Fully remote control
- Easy connection of cables
- Easy testing of cables
- Tested according IEC 62271-200
- Low Total Cost of Ownership (TCO)
Power Xpert® FMX

Applications

- Utilities (Main feeder / Subdistribution stations)
- Cement industry
- Mining industry
- Infrastructure projects
- Hospitals
- Data Centers
## Technical data

<table>
<thead>
<tr>
<th>Metric</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage</td>
<td>kV</td>
<td>24</td>
</tr>
<tr>
<td><strong>General</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lightning impuls withstand voltage</td>
<td>kV</td>
<td>125</td>
</tr>
<tr>
<td>Power frequency withstand voltage</td>
<td>kV</td>
<td>50</td>
</tr>
<tr>
<td>Frequency</td>
<td>Hz</td>
<td>50 - 60</td>
</tr>
<tr>
<td>Protection grade</td>
<td>IP</td>
<td>4X</td>
</tr>
<tr>
<td>Internal arc class</td>
<td></td>
<td>AFL 25kA-1s</td>
</tr>
<tr>
<td><strong>Busbar system</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated current</td>
<td>A</td>
<td>2000</td>
</tr>
<tr>
<td>Short-time withstand current</td>
<td>kA - s</td>
<td>25 - 3</td>
</tr>
<tr>
<td>Peak withstand current</td>
<td>kA</td>
<td>63</td>
</tr>
<tr>
<td><strong>Circuit-breaker</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated current</td>
<td>A</td>
<td>630/800/1250/1600/2000</td>
</tr>
<tr>
<td>Short-circuit breaking current</td>
<td>kA</td>
<td>25</td>
</tr>
<tr>
<td><strong>Mechanism</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated operating sequence</td>
<td></td>
<td>O – 0.3s – CO – 15s - CO</td>
</tr>
<tr>
<td>Class</td>
<td></td>
<td>M2</td>
</tr>
<tr>
<td>Number of operations actuator</td>
<td></td>
<td>30.000</td>
</tr>
<tr>
<td>Number of operations interrupter</td>
<td></td>
<td>30.000</td>
</tr>
</tbody>
</table>
Power Xpert® FMX

Innovation

- ElectroMagnetic mechanism
- Integrated arc absorber
- Flexible breaker
- Cable Test Facility
Power Xpert® FMX

Product Range

- Circuit-breaker panel
- Busbar sectionalizer panel

Options:
- Circuit-breaker
- Change-over switch
- 2 cables
- 3 cables
- Capacitive voltage detection system
- Voltage transformer at the cable (disconnectable)
- Voltage transformer at the busbar (disconnectable)
- Current transformer
Power Xpert® UX

IEC withdrawable MV switchgear up to 24 kV

Features & Benefits
- Air insulated switchgear
- Compact design
- W-VACi vacuum circuit breakers
- Fully third-party type tested to IEC 62271-200
- Solid cast-resin insulation technology
- Mechanical interlocks
- Low Total Cost of Ownership
Power Xpert® UX

Applications
- Oil and Gas
- Process Industry
- Water treatment
- Mining
- Marine & Offshore
- Utilities
# Technical data

<table>
<thead>
<tr>
<th></th>
<th>Unitole UX 12</th>
<th>Unitole UX 17</th>
<th>Unitole UX 24</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rated voltage</strong> kV</td>
<td>12</td>
<td>17.5</td>
<td>24</td>
</tr>
<tr>
<td><strong>Rated frequency</strong> Hz</td>
<td>50/60</td>
<td>50/60</td>
<td>50/60</td>
</tr>
<tr>
<td><strong>Rated power frequency withstand</strong> kV</td>
<td>28</td>
<td>38</td>
<td>50</td>
</tr>
<tr>
<td><strong>Lightning impulse withstand voltage</strong> kV</td>
<td>75</td>
<td>95</td>
<td>125</td>
</tr>
<tr>
<td><strong>Rated current of busbar</strong> A</td>
<td>1250/2000/3150/4000*</td>
<td>1250/2000/3150/4000*</td>
<td>1250/2500/3150/4000*</td>
</tr>
<tr>
<td><strong>External degree of protection</strong></td>
<td>IP4X (42 on request)</td>
<td>IP4X (42 on request)</td>
<td>IP4X (42 on request)</td>
</tr>
<tr>
<td><strong>Internal degree of protection</strong></td>
<td>IP2X (3X on request)</td>
<td>IP2X (3X on request)</td>
<td>IP2X (3X on request)</td>
</tr>
<tr>
<td><strong>Rated peak withstand current (peak level)</strong> kA</td>
<td>up to 125</td>
<td>up to 125</td>
<td>up to 125</td>
</tr>
<tr>
<td><strong>Rated short circuit withstand level (3 seconds)</strong> kA-3s</td>
<td>25/26.3/31.5/40/50</td>
<td>25/31.5/40/50</td>
<td>20/25</td>
</tr>
<tr>
<td><strong>Rated internal arc withstand current</strong> kA-1s</td>
<td>26.3/1s; 31/1; 40/1; 50/0.5s</td>
<td>25/1s; 31/1; 40/1; 50/0.5s</td>
<td>20/25</td>
</tr>
<tr>
<td><strong>Loss of service continuity category</strong> LSC</td>
<td>2B</td>
<td>2B</td>
<td>2B</td>
</tr>
<tr>
<td><strong>Partition class</strong></td>
<td>PM</td>
<td>PM</td>
<td>PM</td>
</tr>
<tr>
<td><strong>Open arc class</strong></td>
<td>AFLR</td>
<td>AFLR</td>
<td>AFLR</td>
</tr>
</tbody>
</table>

*: Forced cooling ventilation required

**:| 50 kA for 0.5 s IAC
W-VACi

IEC medium voltage circuit breakers

Features & Benefits
- IEC 12 kV, 17.5 kV, 24 kV
- Maximum flexibility: withdrawable and fixed configurations
- Cost effective
- Safe and reliable
- Environmental friendly (SF₆-free)
- User friendly
- Tested according IEC 62271-100
Main components

- Vacuum interrupters
- Encapsulated pole units
- Universal mechanism assembly
- W-VACi vacuum circuit breaker
## Technical data

<table>
<thead>
<tr>
<th>Circuit breaker designation</th>
<th>12 kV</th>
<th>17.5 kV</th>
<th>24 kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage</td>
<td>$U_r$ kV</td>
<td>12</td>
<td>17.5</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>$f_r$ Hz</td>
<td>50/60</td>
<td>50/60</td>
</tr>
<tr>
<td>Rated normal current</td>
<td>$I_r$ A</td>
<td>630 - 4000$^{(1)}$</td>
<td>630 - 4000$^{(1)}$</td>
</tr>
<tr>
<td>Rated short-time withstand current</td>
<td>$I_k$ kA rms</td>
<td>25/26.3$^{(2)}$/31.5/40/50</td>
<td>25/31.5/40/50</td>
</tr>
<tr>
<td>Rated duration of short circuit</td>
<td>$t_k$ s</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Pole-center distance</td>
<td>mm</td>
<td>150, 210, 275</td>
<td>150, 210, 275</td>
</tr>
<tr>
<td>Upper-to-lower terminal spacing</td>
<td>mm</td>
<td>205/275, 310, 310</td>
<td>205/275, 275, 310</td>
</tr>
</tbody>
</table>

$^{(1)}$ 4000 A rating with forced cooling.  $^{(2)}$ Tested at 50 Hz.
W-VACi in MV Switchgear

Withdrawable

Fixed

L-frame available for panel builders / OEMs

- Optimized design
- Robust Construction
- Cost-effective
- Mechanical Interlocking
Eaton IEC MV Systems

A complete range of compact SF$_6$ free solutions

Xiria  SVS  FMX  MMS  UX

Safe – Reliable – Sustainable
Low Voltage Systems
Power Xpert® CX

Withdrawable LV Motor Control and Power distribution center

Features & Benefits
• Operator friendly oriented
• Verified by Testing
• Ergonomically innovative design
• Focused on safety of personnel
• Mechanical Test Position
• Modular Design
• Easy to upgrade/exchange
Power Xpert® CX

Applications
• Water Industries
• Industrial facilities
  • Pharmaceutical
  • Food & Beverage
  • Pulp & Paper
  • Steel
  • Mining
• Infrastructure
# General data

<table>
<thead>
<tr>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standards</td>
<td>IEC 61439-1/2</td>
</tr>
<tr>
<td>Form of Separation</td>
<td>3b / 4b</td>
</tr>
<tr>
<td>Degree of Protection</td>
<td>IP31 / IP55</td>
</tr>
<tr>
<td>Internal Segregation</td>
<td>IP2X</td>
</tr>
<tr>
<td>Operating Voltage</td>
<td>380 - 415 V, 50/60 Hz</td>
</tr>
<tr>
<td>Ambient Temperature</td>
<td>35°C</td>
</tr>
<tr>
<td>Service Conditions</td>
<td>-5°C up to 40°C</td>
</tr>
<tr>
<td>Co-ordination Type</td>
<td>Type 2</td>
</tr>
<tr>
<td>Color</td>
<td>RAL7035</td>
</tr>
<tr>
<td>Entry of Cables</td>
<td>Top and/or bottom</td>
</tr>
<tr>
<td>Sheet steel thickness</td>
<td>Door and Frames: 2 mm</td>
</tr>
<tr>
<td></td>
<td>Back, side and top plates: 1.5 mm</td>
</tr>
<tr>
<td>Surface treatment</td>
<td>Electrolytic galvanization</td>
</tr>
<tr>
<td></td>
<td>Powder-coated paint-finish</td>
</tr>
</tbody>
</table>
Main Components

• Air Circuit Breakers
type Eaton NRX & Magnum
• Moulded Case Circuit Breakers
type NZM
• Motor-protective circuit breakers
type PKZ & PKE
• Contactor type DILM

Dimensions (based on DIN standards)

• Height: 2000 mm
• Depth: 600 mm (800 mm @ 4000 A)
• Width: 600 / 800 / 1000 / 1200 mm
Power Xpert® CX

Outgoing withdrawable unit

- 75 mm pitch
- Up to 25 units of 15 kW per panel
- Diversity Factor of 0.8 (min. 0.6 according to IEC)
- Interlocked mechanism to ensure safe connected / test / disconnected positions without using tools
- Padlockable in all defined positions
Intelligent Capitole 40 MCC

- Advanced electronic motor protections
- All relevant MCC data available for Process Automation
- High level of availability (redundant power supplies and communications)
- Proven technology (references around the globe)
- Multi-communication protocol support:
  (DeviceNet, Modbus, Profibus, Ethernet IP)
Features & Benefits

• Complete range from 125A to 6300A
• Fully 3rd Party Certified according to IEC60439-2 EN60439-2, BSEN60439-2
• Tap-offs utilising Eaton’s full range of Circuit Protection devices
LV Busbars

**XP Range, Aluminium**
- 800 A – 4000 A
- IP4X and IP54
- Sandwich type low impedance busbar
  Class ‘B’ Mylar insulation

**XP Range, Copper**
- 500 A – 6300 A
- IP4X and IP54
- Sandwich type low impedance busbar
  Class ‘B’ Mylar insulation

**MP Range, Copper**
- 125 A – 800 A
- IP4X and IP54
- Air insulated
LV Busbars

Applications
- Data Centers
- Hospitals
- Commercial buildings
- Shopping Centers
- Industry
Integrated solutions
M2L

Integrated power distribution system

Features & Benefits

- A compact, integrated solution for medium voltage connection, transformer and low voltage distribution
- Minimize expensive LV cables
- Limit assembly costs
- Very short assembly time
Features & Benefits

- Use of SF$_6$-free MV switchgear
- Save on building costs for the technical rooms
- Limit power losses in the cables
- Use of dry transformers
Power Xpert® Monitoring

Power Xpert® Architecture

- Software
- Meters
- Gateways
- Gateway Cards
- Ethernet Switches
- Integration Services

Benefits

- **Energy reduction:** Reduction of energy cost
- **Power quality:** Identification of certain power quality patterns causing energy losses, outages and equipment damage and consequently down time and loss of production
Protection Relay

EPR line

Available functions:

- Feeder protection
- Combined V, A and cos phi measurement
- Combined protection & control
- Available functions:
  - Voltage and frequency protection
  - Motor protection
  - Motor differential protection
  - Generator protection
  - Generator differential protection
  - Line differential protection
  - Transformer differential protection
  - Busbar differential protection
  - Distance protection
Smart Grids

Xiria - MA

• Different solutions for protection, control and measurement available
• Automatic change-over suitable for self-healing networks
• Several options available for integrated tariff-metering
Power Xpert® FMX

- Complete automated solution, SASensor® solution
- Functionalities:
  - Protection
  - Remote control
  - Measuring
  - Communication
Automated Solutions - MVS

**Power Xpert® UX**

- Complete automated solution, SASensor® solution
- Functionalities:
  - Protection
  - Remote control
  - Measuring
  - Communication

**Diagram:**

- VIM: Voltage Interface Module
- CIM: Current Interface Module
- BIM: Breaker Interface Module
- CCU: Central Control Unit
All information available on:

www.eatonelectric.com/roadshow
Questions?