

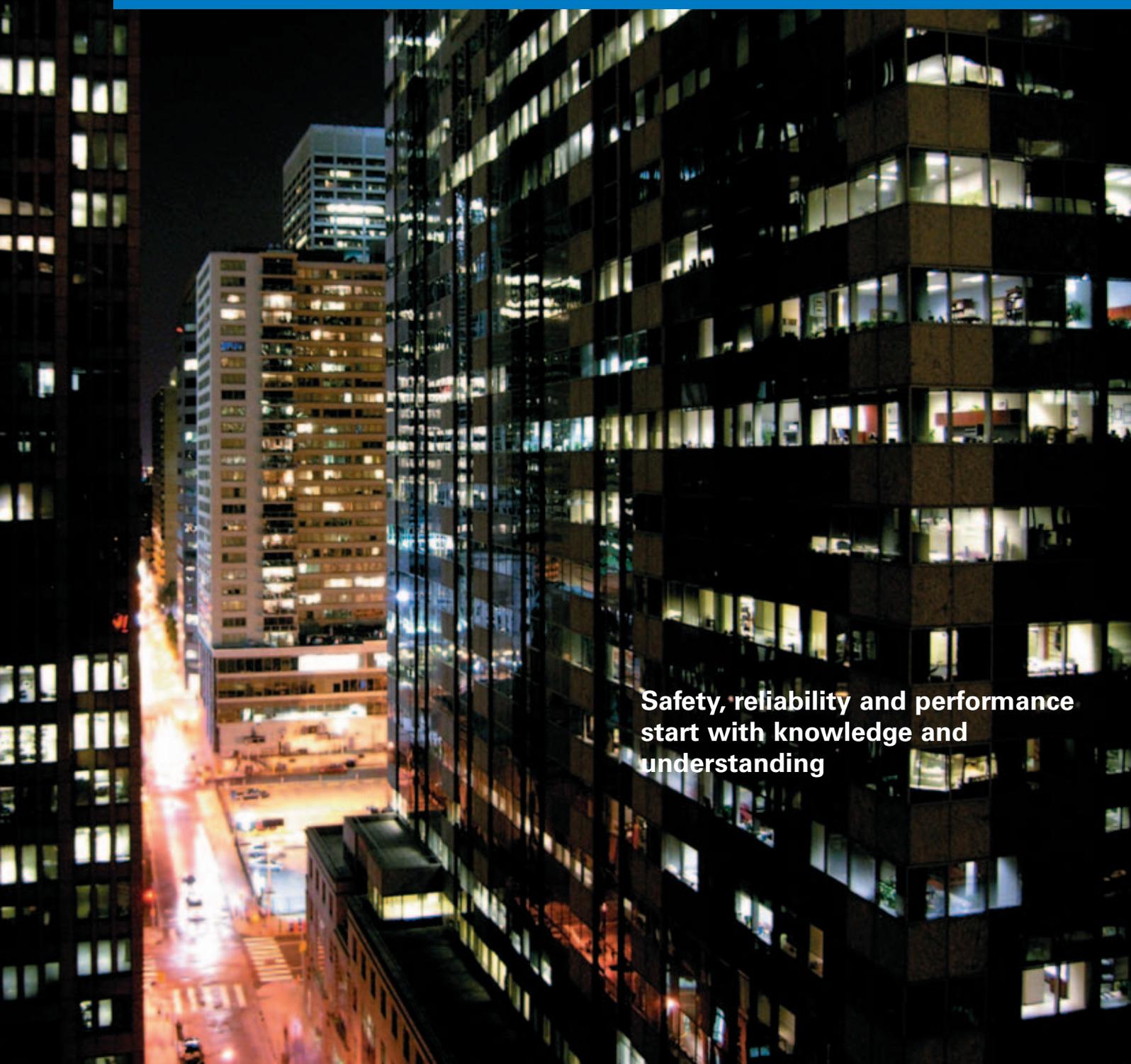


EAT•N

**Tabula
Low Voltage Assemblies**

Product Focus

- Switchboards
- Motor Control Centres
- Fixed, plug-in & withdrawable
- IEC 60439-1 PTTA & TTA



**Safety, reliability and performance
start with knowledge and
understanding**



The KEMA World Panel Programme.

Eaton has appointed a network of Licensed Assemblers who can demonstrate their ability to meet these most exacting demands.

The KEMA World Panel Programme will ensure that systems delivered by panel builder partners comply with our type tested designs, today and every day. Existing type tested configurations and certified components, e.g. KEMA-KEUR components, will be registered with the programme to enable our joining partners to supply products of the highest quality and integrity, giving them and their customers total confidence, providing traceability and removing the need for further expensive type testing programmes of their own. In effect we will transfer our investment in product development, testing and certification to our partners, thus adding value to their customer's system.



Your independent verification process

As an end-user you want a reliable and safe application. But can you be sure that the tailor-made panel or motor control centre that is delivered to you meets the optimum safety level? And do you have the extensive knowledge and time needed to verify this? A low voltage distribution and control panel is the product of a long supply chain; a complex process in which several parties operate relatively independently of each other. And if one element fails to function, the rest will follow.

The KEMA World Panel Program offers help. This new certification program for panels prescribes a higher entrance level and focuses on both the assembly- and the original manufacturer.

Complex process

End users desire a panel that meets the needs for a sufficient, reliable and safe energy supply. A consultant, advising the end user, draws up the technical specifications. On the basis of these, a local assembly manufacturer constructs the definitive panel, which is in fact a tailor-made product based on a modular panel system produced by one of the original manufacturers. The assembly manufacturer selects panel system parts and electrical components in such a way that the assembled end result meets the technical requirements.

In a nutshell, several parties operate relatively independently of each other in a chain. But who is responsible in case something happens?

One thing is certain: all stakeholders want to avoid unsafe applications. The question is whether or not the outcome of the process – tailor-made panels - meet the desired safety level of all the stakeholders involved.

Very often, the original panel system family is type tested. But are the various number of tailor made panels constructed by local assembly manufacturers also covered by this type test? And are all the important switching components certified?

KEMA discussed the current type testing/certification programs with all stakeholders. The conclusion was that the currently available measures leave much room for interpretation and have a rather low entrance level.

Higher entrance level

In comparison with existing measures, the KEMA World Panel Program will undoubtedly have a higher entrance level. At component level, the KEMA World Panel Program prescribes certification for the main components instead of only a type test. This implies monitoring of certified products continuously.

At panel level the program incorporates both the original manufacturer and the assembly manufacturer. The quality system certification at an original manufacturer level includes product quality aspects, communication with assembly manufacturers and verification of the assembly manual against the original type test that was carried out.

'At the assembly manufacturer stage KEMA also go beyond existing measures. They will ask the assembly manufacturer to write down a risk assessment for the application, which includes the consequences of national installation codes and conditions of use. KEMA also checks the correct use of the assembly manual by the assembly manufacturer.' The unique point of the KEMA World Panel Program is that it covers individual panels. When a panel is constructed it will have a unique identification. All certificates and test reports will be stored in an extranet environment. In this way, ongoing compliance with the KEMA World Panel Program can be monitored.

Extract from the KEMA World Panel Program Report

www.kema.com/kemaworldpanelprogram



Tabula low voltage assemblies – designed to meet the demands of your application.

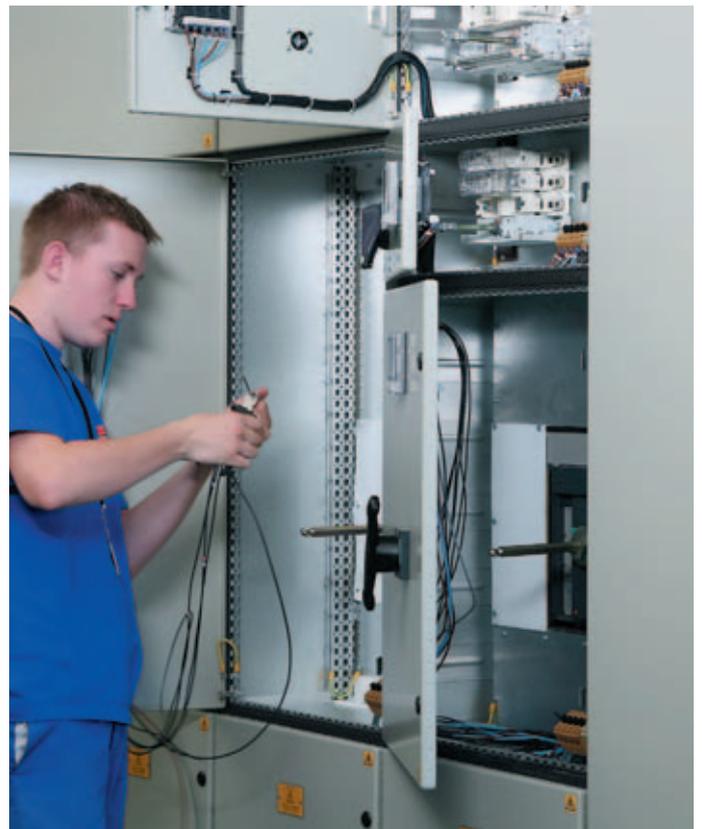
As industry requirements and statutory regulations have increased over the years, so have the demands for safety, reliability and performance. The total understanding and application of IEC 60439-1 is now vital.

Equally essential is the need to balance these demands with available resources. Clearly competitiveness and effective cost savings are relevant deciding factors in the majority of installations.

Eaton's Tabula solution is provided through a partnership of Licensed Assemblers which form a unique relationship. This relationship provides the most flexible solution for any application. The combination of Eaton's corporate strength, and the knowledge and understanding of its independent Licensed Assemblers, answers all the demands of stability, excellence and attention to detail that an individual project may call for.

Eaton's Tabula Type Tested Assembly provides an enclosure and component system where the technical and commercial advantages are obvious and in balance.

After the steps that must be taken to obtain CE compliance, KEMA-KEUR is a logical continuation. This certification mark gives extra assurance of an independent test conducted by an expert body, confirming not only that the test models have third party approval but also that the products manufactured are subjected to ongoing surveillance.



Performance | Whatever your business, downtime is unacceptable, information invaluable and cost savings vital.



Circuit-Breaker protection

Whether you are maintaining the water supply to a community, or responsible for the integrity of hospital electrical supply you will need to have all systems running to maintain the required levels of operational performance – you need to be on line 24/7/365.



Fuse Switch protection

When your demands require high levels of shock and vibration as experienced on board marine vessels rigidity and strength are paramount.

Eaton's Licensed Assemblers provide the local engineering and integration expertise to combine Eaton technologies into a high performance system. Eaton's automation and control, and power management components provide all the functionality required to deliver measurable cost reductions and productivity improvements, with an emphasis on power integrity and protection, connectivity and control.

Through open communications networks, we offer a complete window into your power system. We can tie directly to your Building Management or PLC systems.



Motor control



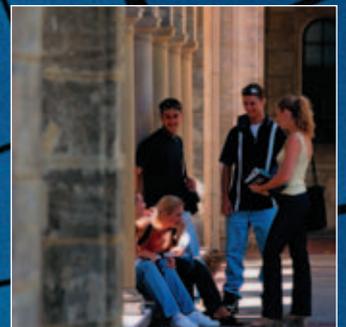
Intelligent Command and Control



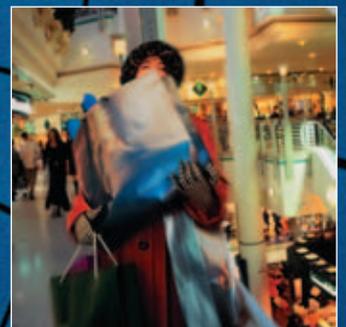
Hospitals – security of power supply



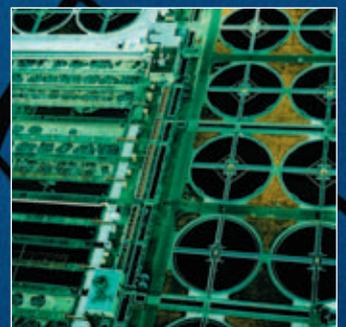
Marine – withstanding mechanical stress and vibration



Universities and schools – managing the facilities for optimum performance



Commercial facilities – minimise plant-room footprint, maximise earning space



Utilities – maintain continuity of services with intelligent control and automation

Construction projects – meet critical path deadlines with a flexibility to respond to late change requests

Flexibility | Modular design options enable the Tabula system to meet individual requirements for both Power Distribution and Motor Control Centre applications.

Eaton's Tabula Motor Control configuration is flexible and modular and allows for inclusion of Fixed, Withdrawable and Plug-in compartments within the same vertical structure.

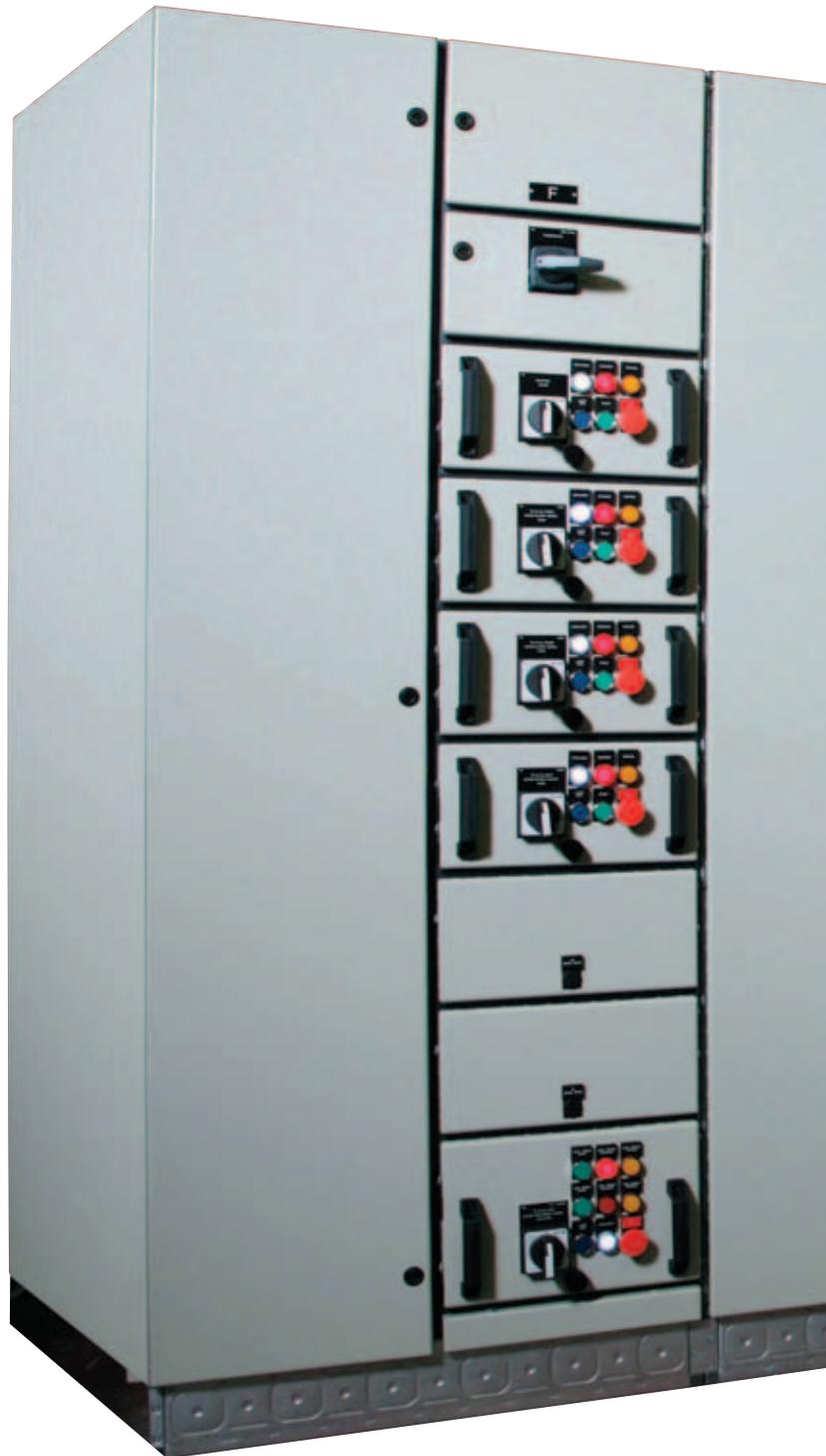
Type Tested to IEC 60-439-1 with Eaton's latest Air Circuit Breakers, Moulded Case Circuit Breakers, Fuse Switches, Disconnect devices and Control components the Tabula Motor Control Centre sits at the heart of your process, it monitors, protects, controls and manages the power integrity of your installation.

All Eaton's components used in the Type Tested Tabula Motor Control Centre configuration are third party tested by KEMA and carry the KEMA KEUR mark. This recognition confirms continuous and on-going independent verification and inspection of manufacturing facilities to ensure compliance to component standards. This investment ensures that Eaton's components meet exacting international recognised standards on a continuous basis.

Intelligent Motor Control applications are easily accommodated within the Tabula system. Eaton's Clink II motor management and SCADA system, combined with PanelMate HMI products ensure the most advanced control and automation applications can be provided.

Patented silver plated main power connections provide high contact pressure when connected to the main vertical C Form busbars. The design takes advantage of the high electro-mechanical forces, which are present under short circuit conditions to increase further the contact pressure on these power stabs. This ensures high integrity of electrical connection under all conditions.

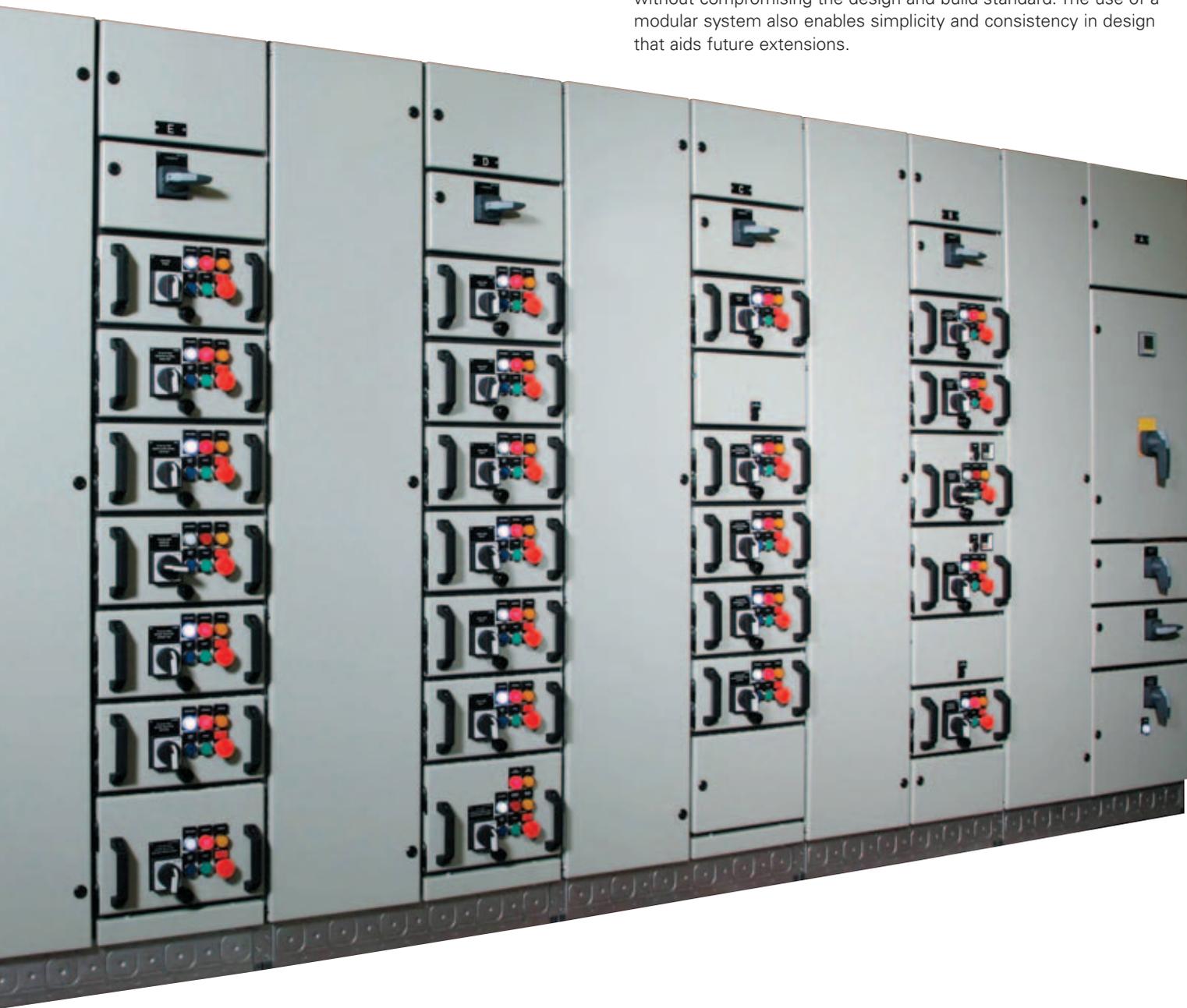
Thirty control connections are provided, rated at a maximum 16Amps, and are silver plated with an option for gold plated for low power applications.



Compartment doors are mounted on the cassettes but when removed, IP20 protection is assured by insulating barriers within the compartment. Cassettes can be mechanically coded for functionality and rating to ensure only correctly rated cassettes are fitted into specific compartments.

Modularity

Tabula is built on a basic module of 126mm in all dimensions. The modularity of the Tabula system outperforms all other enclosure systems in versatility. Tall, short, multi-height, deep or shallow, Tabula can be tailored round corners, up or down steps – in fact any which way that suits the shape of your existing or planned site without compromising the design and build standard. The use of a modular system also enables simplicity and consistency in design that aids future extensions.



Withdrawable starter in the fully withdrawn position

Withdrawable compartments

- Fast exchange of draw-out cassettes
- Easy access during service
- Service and repair can be executed with live busbars
- Reduced downtime in production
- Suitable for preventive maintenance
- The maximum withdrawable rating is 630Amps.

Designed with three distinct padlockable positions to facilitate safe working conditions.

Position 1 – Fully inserted.

The starter is fully engaged and functional.

Position 2 – Partially withdrawn.

Mains isolated, controls connected for test and commissioning. Ingress protection IP20.

Position 3 – Fully withdrawn.

The starter is isolated from both mains and control and can be removed safely.

Flexibility | Modular design options enable the Tabula system to meet individual requirements for both Power Distribution and Motor Control Centre applications.

A choice of Fixed and Plug-in compartments are available within the same vertical structure.

Eaton's Tabula Switchboard has been type tested with Eaton's latest Air Circuit Breakers, Moulded Case Circuit Breakers, Miniature Circuit Breakers and Fuse Switches as an integral part of the design for both incoming and outgoing applications.



Air Circuit Breakers

Eaton's range of Air Circuit Breakers are engineered specifically for use in low-voltage assemblies applied at nominal voltages up to 690 volts with 10 continuous ratings 800 to 6,300 amperes in 3 frame sizes and interrupting withstand ratings of up to 100kA for 1 second. Fixed and Withdrawable units are available in 3 or 4 pole designs. Controls are conveniently located at the front of the unit where they can be easily accessed. A full range of programmable and electronic trip units are available to offer you a choice of protection, information and communication capabilities to meet your specific requirements.



Moulded Case Circuit Breakers

From the main incoming device through to the final feeders Eaton's range of Moulded Case Circuit Breakers are designed for applications anywhere in the world. The MCCB range includes standard thermal and magnetic as well as electronic trip units for ultimate system flexibility in 5 frame sizes from 16 to 2,500 amperes, interrupting capacities up to 100kA and voltages up to 690 volts. Eaton's family of electronic trip units provide unparalleled fault protection, curve shaping, system diagnostics and monitoring with communications available to provide the ultimate higher level energy management and system protection solutions.



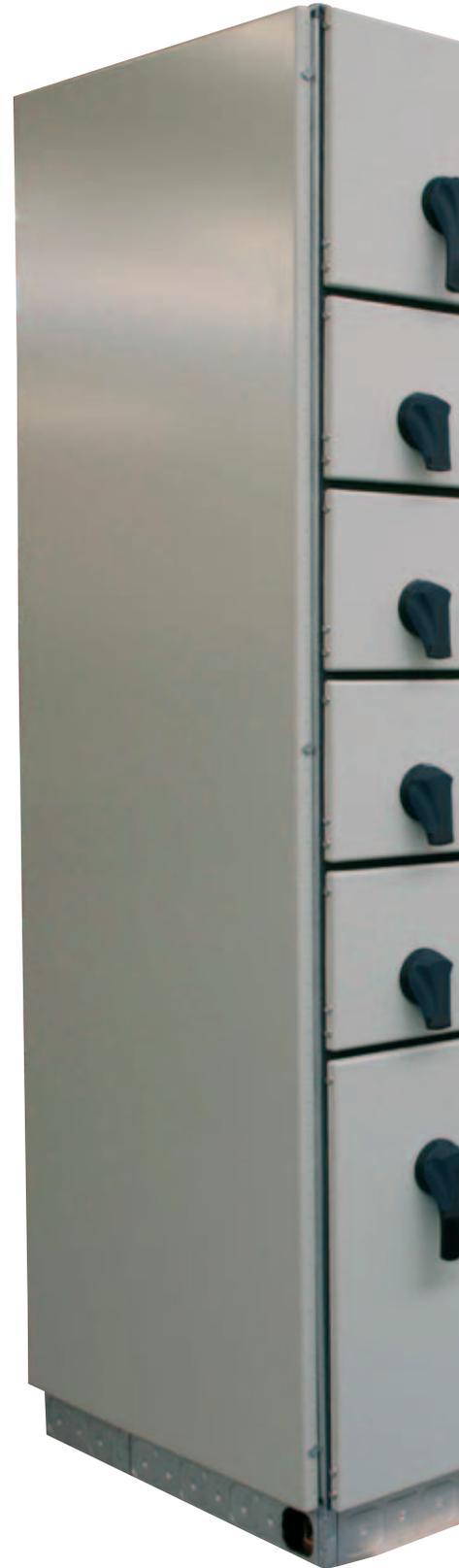
Fuse Switches

With ratings up to 2,000 amperes and 690 volts Eaton's range of Fuse Switches and Disconnect devices provide unparalleled solutions for isolating and switching resistive or inductive loads. With the ability to use either DIN or BS type fuses Eaton's range of fuse switches offer world-wide application possibilities. Eaton's panel mounting switch applications include change-over, multi-pole switching mechanisms. The complete range of switches is fitted with Eaton's universal handle mechanism resulting in a switchboard of uniform appearance and operator familiarity.



Miniature Circuit Breakers

With a full range of miniature circuit breakers and accessories Eaton provides final circuit protection for all small power and lighting requirements. With trip characteristics types B, C and D and single, double, triple and four pole configurations, a wide range of protection for any specific application can be met. A range of earth fault protection is also provided with in this modular range. Standard distribution board busbar systems are an integrated design of Tabula.



Modularity

Tabula is built on a basic module of 126mm in all dimensions. The modularity of the Tabula system outperforms all other enclosure systems in versatility. Tall, short, multi-height, deep or shallow, Tabula can be tailored round corners, up or down steps – in fact any which way that suits the shape of your existing or planned site without compromising the design and build standard. The use of a modular system also enables simplicity and consistency in design that aids future extensions.



Power Quality

Eaton's Transient Voltage Surge Suppression (TVSS), Power Factor Correction Capacitors (PFCC) and Uninterruptible Power Supplies (UPS) can be integrated within the Tabula system to provide power quality and security of supply. Advanced measuring, monitoring and power analysis with communications are available via Eaton's range of power quality management solutions.

Integration with Building Management Systems and Facility Management Systems via the Eaton range of electronic trip units and power measurement meters can be readily achieved. When combined together this provides the highest level of system integrity and performance.



Safety & reliability | The strength of a Low Voltage Assembly is its design focus on critical areas, coupled with engineered solutions, verified through rigorous testing.



Critical design areas

There are a number of specific critical design areas that demand close attention when verifying the reliability of a Low Voltage Assembly.

• Construction

The Tabula structure is of a very robust construction and has undergone extensive mechanical shock and vibration type tests, calculations have shown that earthquake resistance up to 7 on the Richter Scale is possible.

The basic enclosure parts are manufactured from sheet steel which has an Aluminium/Zinc coating. Aluzinc™ provides excellent resistance to corrosion, as well as providing excellent electrical conductivity to provide superior panel earth continuity for protective earth circuits.

All external doors and covers are finished with polyester powder paint which, in combination with an iron phosphate of the sheet steel, provides high levels of corrosion protection and a long life.

• Arc containment

Tabula has been designed to withstand internal arc faults in accordance with the following standards; SEK405, IEC 61641, PELHA Richline Nr 4.

• Forms of separation

Forms of separation from Form 1 to Form 4b, including Form 4 Type 7 are available in the standard Tabula product offering.

• Ingress protection

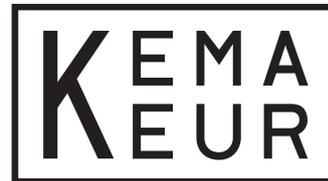
Tabula has a standard IP31 ingress protection, however IP54 protection is possible with the use of Tabula supplied gasketing.



In combination with Eaton's comprehensive range of circuit protection and control devices the Tabula system provides an unequalled total system design and build standard.

• **Component Compatibility:**

Of the ten statutory tests required to claim a type tested assembly to IEC 60439-1 Eaton believes that the temperature rise limitation test is the most critical. This is because devices create heat and unless components are tested as a complete combination there is no absolute way of knowing if the temperature rise is within tolerance limits. To ensure integrity, Eaton not only uses the knowledge obtained in testing the Tabula structure, but combines this with the tests already carried out under the device standards, IEC 60947, and other relevant standards for the individual components themselves, so that there is no doubt of the precise temperatures generated by different device combinations. The wealth of information gained from these tests enables Eaton to share an intimate knowledge of the behaviour characteristics of its components with its Licensed Assemblers, thus providing an unequal set of design and build standards.



Failure within just one part of a Low Voltage Assembly could have resounding consequences throughout the whole operation. For this reason a variety of standards now exist to cover all the different aspects of the construction, design and testing of the assembly to ensure their safe and reliable operation – not just the verification of the fault capacity of the busbar system.

It is essential that this mandatory verification as defined in IEC 60439-1 Clause 8.2 has been rigorously implemented and endorsed with third party test certificates. Omission of just one of these tests undermines the confidence of the complete design. Eaton, as a supplier of the Tabula enclosure system and complete range of IEC certified components, has an intimate knowledge and understanding of their performance and operating characteristics.

This depth of understanding inspires ultimate confidence to safeguard complete design and build integrity.

As well as enabling the Licensed Assembler to meet any number of onsite application requirements the Tabula system provides equal flexibility in its approach to reliability and personal safety demands without compromising the commercial and technical requirements.

• **Busbar Systems**

The Tabula Busbar System is KEMA type tested and designed to be maintenance free and easy to extend. The busbar system has a high current carrying capacity with high short circuit withstand ratings and available in two basic configurations:

- i. Insulated Horizontal busbars are available up to 3200A and 85kA for 1 second.
- ii. Air Insulated Horizontal busbars are available up to 7800A and 120kA for 1 second.

The vertical busbars are fitted with a set of interlocking, insulating screens, these provide a degree of protection to IP2X when the functional units are removed. These screens also prevent the propagation of internal arcs under internal fault conditions.

The vertical busbars are a unique C shape. This design provides a high degree of safety and reliability under fault conditions as they are designed specifically to increase the contact pressure and force applied to the connection points under fault conditions.

All connections and joint designs are type tested to ensure system reliability and long life.

• **Main Incoming Devices:**

The Main Incoming system is type tested with Eaton devices with pre-engineered and supplied copper connections and removable CT links as required.

• **Compartment Configurations:**

Tabula offers three basic compartment configurations, fixed, fully withdrawable, and plug-in, with comprehensive combinations of compartment widths and depths. The main connections from the vertical busbars to the compartment device have an engineered low fault zone to ensure the lowest possible probability of an internal arc fault occurring.

No.	Characteristics to be checked	IEC60439-1 Clause number
1	Temperature Rise Limits	8.2.1
2	Dielectric Properties	8.2.2
3	Short-circuit withstand strength	8.2.3
4	Effectiveness of the protective circuit	8.2.4
	Effective connection between the exposed conductive parts of the Assembly and the protective circuit	8.2.4.1
	Short-circuit withstand strength of the protective circuit	8.2.4.2
5	Clearances and creepage distance	8.2.5
6	Mechanical Operation	8.2.6
7	Degree of Protection	8.2.7

Partnerships | A unique relationship between Eaton and its Licensed Assemblers, verified by KEMA

In order to deliver the ultimate safety, reliability and performance from a Switchboard or Motor Control Centre Eaton has appointed a network of Licensed Assemblers who can demonstrate their ability to meet these most exacting demands.

To take Eaton's Tabula system and then engineer it into your Power Distribution or Motor Control System requires the skills of companies who demonstrate the same sensitivity – and who set the same high standards of design integrity and quality systems – as Eaton itself.

The unique relationship that Eaton has with its Licensed Assemblers provides the most flexible solution to any size of Switchboard or Motor Control Centre application.

A combination of Eaton's corporate strength, together with the empathy of its independent manufacturing network, answers all the demands of stability, excellence and attention to detail required to meet any combination of specific requirements that an individual project may call for.

These partnerships are far from marriages of convenience. They are real co-operations that have been formed to ensure that customers receive the full benefits of all the research and development that has gone into creating the Tabula System, together with the industry specific or local area expertise that can be brought to bear by the professionalism of Eaton's Partners.

The KEMA world panel programme provides you that independent verification.



Tabula technical data

Fully documented low voltage structure system, in accordance with IEC/EN 60439-1 and 3

Enclosure Modular aluzinc assembly system
Basic Module: 126 x 126 x 126 mm
Degree of Protection: IP20 to IP54
Internal Division: Form 1 to 4b and Form 4 Type 7
Contact Resistance of Exposed Conductive Parts: Max. 1,5 milli Ohms

Doors Colour: TABULA blue, BS 4800 blue or grey RAL 7032.
Corrosion (standard): 300 hours salt spray test acc. to ISO 7253
Corrosion (special): 1440 hours salt spray test acc. to ISO 7253

Busbar system Rated Current: 225 A to 7800 A
Rated Short-Time Withstand Current: 5.4 kA to 120 kA
Rated Peak Withstand Current: 46 kA to 264 kA
Rated Operational Voltage: 690 V (1000 V - special design)
Insulation Rated Voltage, U_i : 1000 V
Rated Impulse Withstand Voltage, U_{imp} : 12 kV
Max. test Voltage, V_{eff} : 3500 V for 1 minute
Insulation Material: Material class IIIa. Flammability UL94-V0. Glow wire test, 960°C acc. to IEC 60695-2-1
Creepage Distances 25 mm phase-phase, 19 mm phase-earth
Clearances 19 mm phase-phase, 16 mm phase-earth

Draw-out system Rated Current: 125 A to 630 A
Rated Conditional Short-Circuit Current: 100 kA
Rated Impulse Withstand Voltage, U_{imp} : 12 kV
Max. test Voltage, V_{eff} : 3500 V for 1 minute.
Max. Fault Current for unit with Earth contact, prospective 50 kA
Contact Resistance from Tray Bottom to Enclosure: 1,5 milli Ohms
Insulation Material: Material class IIIa. Glow wire test, 960°C acc. to IEC 60695-2-1.

Draw-out system sliding contacts Rated Current, I_n : 16 A
Rated Conditional Short-Circuit Current with Fuse, I_{cf} : 50 kA
Rated Impulse Withstand Voltage, U_{imp} : 6 kV
Max. test Voltage, V_{eff} : 3500 V for 1 minute.
Insulation Material: Material class IIIa. Glow wire test, 960°C acc. to IEC 60695-2-1.

Norm reference IEC/EN 60439-1

Aluzinc 20 μ m aluzinc coated steel plate. Steel plate according to DIN 1623/1541. Aluzinc coating according to EN 10142.



Eaton's electrical business is a global leader in electrical control, power distribution, uninterruptible power supply and industrial automation products and services. Eaton's global electrical brands, including Cutler-Hammer®, Powerware®, Holec® and MEM®, provide customer-driven PowerChain Management™ solutions to serve the power system needs of the industrial, institutional, government, utility, commercial, residential, IT, mission critical and OEM markets worldwide.

Eaton Corporation is a diversified industrial manufacturer with 2006 sales of \$12.4 billion. Eaton is a global leader in electrical systems and components for power quality, distribution and control; fluid power systems and services for industrial, mobile and aircraft equipment; intelligent truck drivetrain systems for safety and fuel economy; and automotive engine air management systems, powertrain solutions and specialty controls for performance, fuel economy and safety. Eaton has 60,000 employees and sells products to customers in more than 125 countries. For more information, visit www.eaton.com.

Eaton Holec ApS
Niels Bohrs Vej 2
DK-7100 Vejle
Denmark

Customer Support Centre
Tel: +45 76 405 400
Fax: +45 76 405 401
infoDK@eaton.com

Eaton Electric Limited
Reddings Lane
Birmingham B11 3EZ
United Kingdom

Customer Support Centre
Tel: +44 (0)8700 545 333
Fax: +44 (0)8700 540 333
ukcommorders@eaton.com

Eaton Electric BV
PO Box 23
7550 AA Hengelo
The Netherlands

Customer Support Centre
Tel: +31 (0)74 246 7066
Fax: +31 (0)74 246 7070
c-europesupport@eaton.com

Eaton Electric Limited
Dubai World Trade Center
Level 23, PO Box 9398, Dubai
United Arab Emirates

Customer Support Centre
Tel: +971 4 331 3938
Fax: +971 4 332 9239
SalesOffDubaiUAE@eaton.com

Eaton Electric Systems Pty Ltd
10 Kent Road
Mascot, NSW 2020
Australia

Customer Support Centre
Tel: +61 2 9693 9388
Fax: +61 2 9693 1258
AustraliaSales@eaton.com

