

UL 891 EVOLUTION UL 845 MOTOR CONTROL CENTER



TQM

multisystem



LOW VOLTAGE SWITCHBOARDS FOR THE NORTH AMERICAN MARKET



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UL891 EVOLUTION

The new series of TQM UL Evolution switchboards that Righi Elettroservizi offers alongside the previous one has been designed and tested according to the North American UL 891 standard. This standard is normally defined as a "Tristandard". This means that there are three rules with exactly the same content:

- CSA Group: CSA C22.2 No. 244-05 (for Canada)
- Underwriters Laboratories Inc: UL 891 (for the United States)
- Association of Standardization and Certification: NMX-J-118/2-ANCE-2012 (for Mexico)



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The UL 891 Standard refers primarily to switchboards with a rated voltage of 600 V (or less) and intended for use in accordance with the Canadian Electrical Code (Part 1), the National Electrical Code (NEC), ANSI/NFPA 70 and the Mexican Standard for Electrical Installation (NOM-001-SEDE). These requirements cover switchboards intended for use in circuits with a symmetrical short-circuit RMS current of less than 200 kA. Building in accordance with UL 891 means producing robust and flexible power distribution boards, which are required in industrial production systems, shopping malls, hospitals, structured buildings in North America and Mexico.

TQM UL Evolution switchboards manufactured according to UL 891 allow the highest level of customisation available for North American markets.

FEATURES

• Degree of accessibility

High degree of accessibility for control, modification and/or maintenance operations. In fact, it is possible to build equipment accessible from the front or from the back or, for wall-mounted panels, a frontal accessibility has been developed that also allows maintenance activities on all active parts and not on the switchboard

• Switches

Use of UL 489 compliant circuit breakers and non-circuit breakers, both in air and boxed. UL 1066 compliant switches can also be used where the criticality of the application requires it. The switches can be either fixed or withdrawable.

• Thermal monitoring

If requested by the customer, it is possible to build the TQM UL Evolution switchboard with the requirement of complete access to the busbar system on which to implement thermal surveillance systems.

• Control system

Each switchboard to be built whose main switch exceeds the rated current of 1200 a is equipped with arc monitoring system (arc flash monitoring system)

• Structures and carpentry

The support structures and the carpentry are modular, allowing for possible expansions, if necessary, in

a functional and reduced installation time.

• Cable compartment

Cable compartments are designed to facilitate cable termination and installation

• Accesses

Secure front access thanks to fully segregated wiring, control and communication sections (Dead-front Switchboard: a switchboard which has no exposed live parts on the front).

• Connections

The connection to the switches can be required both with bottom and top arrival; the main power supply line





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of the switchboard can also be made in prefabricated busbar duct, thus facilitating the installation of the TOM UL Evolution UL 891 switchboard in the most critical contexts.

• Main system

The copper bars with which the main distribution system is made, are nickel-plated, silver-plated or tin-plated according to the customer's needs and according to the environmental pollution conditions at the place of installation.

• Diagnostics

The TOM UL Evolution UL 891 switchboard can be made with the equipment of the main brands

of switches and other accessory products. Depending on the brands used, switch status diagnostics and electrical parameter analysis can be implemented, thus structuring an energy management system.

• Protection

The degree of protection of the carpentry is normally a NEMA TYPE 1 (NEMA TYPE 3R grade is being certified).

• Rated current

TOM UL Evolution allows the construction of switchboards up to 6,000 A rated current and up to 200 kA withstand at a symmetrical short circuit current of 480 V 60 Hz.

• Certifications

The marketing of UL 891 compliant switchboards is carried out by means of certification by a special and recognised third party body, which is currently the QPS body

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Every aspect of the design of the TQM UL Evolution switchboard is aimed at improving safety, practicality and functionality as well as reducing installation costs and time, while maintaining the construction and service reliability required by regulations.

ARC FLASH MONITORING SYSTEM

The installation of an arc flash monitoring system to protect against the onset of an internal arc, minimises the material damage to which the switchboard may be subjected, allows a rapid restoration of power distribution and ensures better safety of personnel. A special relay detects an electric arc using the fiber optic sensor system or optical sensors. The total reaction time is less than 2.5ms (a) plus the opening time of the main switch (b) and in any case the total time (a)+(b) shall be less than 50ms. The TQM UL Evolution switchboard

meets these values. The optical fibre or optical sensors are placed in positions to monitor all points where an electrical arc could develop: main and distribution busbar compartments, junction busbar connections to circuit breakers for both upper and lower poles, cable arrival or departure compartments and electrical connections in general. The TQM UL Evolution switchboard meets these requirements.

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THREE-DIMENSIONAL DESIGN

The TOM UL Evolution switchboard has been completely designed with a three-dimensional program. Every switchboard that is made for the customer is also designed with a three-dimensional program in order to optimise the processing time in the strictly production phase. The 3D design allows the assembly of structural elements, panelling, doors, bars and supports, the realisation of all the necessary drillings on bars and carpentry during the specific workings of the semi-finished products, so that every piece ready for the purpose can be delivered

to the assembly departments, without further manual operations, except those related to mechanical assembly such as tightening of bolts or screws.

This feature, the 3D design, in addition to ensuring absolute precision in the realisation of the semi-finished products required and therefore limiting any errors to a minimum, allows to significantly shorten the processing time and therefore delivery of the product.



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The TOMCC is a low voltage switchboard with withdrawable unit technology mainly used where a large number of motors have to be controlled by different starting modes.

With its withdrawable unit technology based on a proven global design, TOMCC offers a superior level of safety while minimising downtime. The units are removed and re-assembled without the use of tools and without opening the door.

The MCC TOMCC switchboard has a robust and modular design that combines labour saving with high electrical characteristics and many special safety features.

The MCC TOMCC switchboard is designed to provide the greatest protection against internal arc faults and limit the risks for operators.

TOMCC will make your installation more efficient, ensuring total safety for personnel and equipment, ease of use, maintenance and future upgrades without power interruption.

The continuous evolution of our products is based on a team that makes passion and trust its fundamental values, because only in this way we can be able to develop the best solution to our customers' requests.

TOMCC offers the best features of a UL 845 compliant product.

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REGULATIONS



TOMCC complies with the following regulations:

- UL 845 – Low Voltage Motor Control Centers
- UL 508 -Industrial Control Equipment
- UL 891 -Switchboard Design
- UL 94 Test for Flammability of Plastic Materials for Parts, Devices, and Appliances
- UL 489 -Molded Case Circuit Breakers and Circuit Breaker Enclosures
- NEMA ICS 18–Motor Control Centers
- NEMA ICS 1 -General Standards for Industrial Control
- NEMA ICS 2.3 Industrial Control Systems
- Latest Version of the National Electric Code, and the Canadian Electrical Code
- C37.20.7-2017 - IEEE Guide for Testing Switchgear Rated Up to 52 kV for Internal Arcing Faults



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MAIN TECHNICAL DATA

Electrical parameters

| | |
|-----------------------------------|--|
| Rated operating voltage available | 208Vac, 240Vac, 480Vac |
| Available electrical systems | 3 phases, 3 cables (Delta); 3 phases, 4 cables (Wye) |
| Frequency | 60 Hz |
| Voltage tolerance | +/-10% |
| Short-circuit withstand 480Vac | 65KA |

Electrical parameters in direct current

| | |
|--|--------------------------|
| Horizontal main bars | 600A, 1000, 1250A, 1600A |
| Vertical main bars | 400A, 800A |
| Neutral bars (horizontal) | 800A |
| Earth bar | 400A |
| Short-circuit withstand: horizontal bars | 65KA 1s |
| Short-circuit withstand: vertical bars | 65KA 50ms |

Arc resistance parameters

| | |
|-------------------------|--------|
| Arc resistance type | 2A |
| Available fault current | 65KA |
| Arch duration | 200ms |
| Test voltage | 480Vac |

Environmental data

| | |
|---------------------------------|----------------------|
| Ambient temperature (indoor) | -30C to 65C |
| Ambient temperature (operating) | 0°C to 40°C |
| Humidity | 95% (Non-condensing) |
| Altitude | 1000m (6600ft) |

Mechanical data

| | |
|---|---------------------------------------|
| Degree of protection | NEMA 1, NEMA 1A |
| Height | 91" (2300mm) |
| Width | 20" (508mm) (25", 30", 35" available) |
| Depth | 20" (500mm) (25", 30", 35" available) |
| Above channel | 10" (250mm) |
| Under channel | 8" (200mm) |
| Vertical channel height | 90" (2280mm) |
| Vertical channel width | 4" (100mm) (8", 12", 16" available) |
| Unit encumbrance | 72" (1829mm) |
| Increases in overall dimensions | 6" (150mm) |
| Size HD High Density Unit (0.5 space factor unit) | 6" (150mm) |
| Size 1 (1 space factor unit) | 12" (300mm) |
| Size 2 (2 space factor unit) | 18" (450mm) |
| Size 3 (3 space factor unit) | 24" (600mm) |
| Size 4 (4 space factor unit) | 30" (750mm) |
| Size 5 (5 space factor unit) | 35" (900mm) |
| Other units(with increment 0.5 space factor) | available on request |

Frame thickness

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|------------------|--------------------|
| Frame components | 14 thickness (2mm) |
| Basic channels | 8 thickness (4mm) |

FEATURES

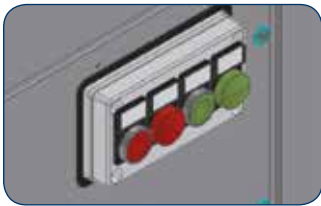
- **Standard finish**

The cold rolled sheets are subjected to the epoxy powder treatment and painting cycle carried out in tunnels and preceded by degreasing, rinsing, phospho-degreasing and oven drying cycles. After the application of the non-toxic epoxy powders the cycle ends with firing in the oven at 200°C. The standard paint finish is a light grey ANSI 61. Other colours are possible at the customer's request.



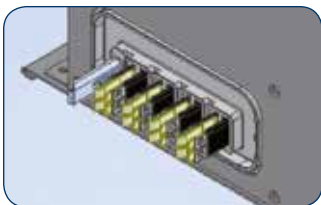
- **Withdrawable units**

TQMCC incorporates unique withdrawable unit technology. All units are supplied with withdrawable terminals for control and power connections that are automatically connected when the unit is plugged in. Since the door is an integral part of the unit, it is not necessary to open the front door to remove the unit. To fix each door in place, the closures are made with quarter turn screws. Withdrawable Drawers True! Withdrawable running unit: no conductor unplugging operation must be executed. The above sentence best expresses the innovative and unique peculiarity of the product.



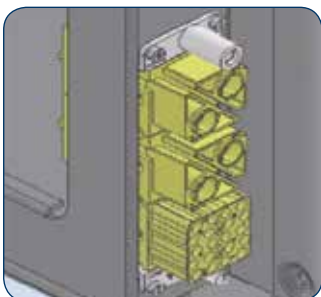
- **Frontal push-button panel integral with the inner case**

TQMCC incorporates withdrawable units equipped with push-button panel (Pilot Device Housing) to house up to 4 signal lamps or 22mm diameter control operators. The push-button panel box is integral with the internal structure of the drawer and therefore remains fixed to it even when the external door is opened.



- **Power supply connectors**

TQMCC incorporates withdrawable units with power connectors on the back of the drawer that plug into the rear bars of the column. These connectors have a minimum rated current of 250 A. A connection of 250 A minimum means no problem in terms of heating the connection point, which in these types of switchboards is always a delicate point. Each of these pliers also allows connection to the ground bar (located at the rear of the drawers) which ensures that ground continuity is established at least 3.2 mm (0.125 in) before the pull-out couplings (pliers) and is maintained until the pull-out couplings (pliers) are de-energised with a stroke of at least 3.2 mm (0.125 in) as required by UL 845.



- **Output power connectors**

The drawers of the TQMCC switchboard in withdrawable version are equipped with automatic plug-in connectors on the output side that include both power and auxiliary terminals. The rated current of these connectors varies from 40 to 200 A.



- **Automatic shutters**

The drawer area and the vertical busbar area are segregated by a vertical sheet metal wall in which there are the connection sockets on which the pliers will then be inserted when the drawer is inserted. These connection sockets are to all effects of the shutters (automatic vertical bus shutters) which have an IP41 degree of protection (according to IEC standards) with the drawer removed, so accidental contact by personnel is absolutely prevented. Special automatic systems provide for the opening of these shutters when the drawer is inserted and their automatic reclosure when the drawer is removed.

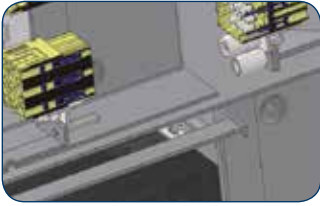
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FEATURES



- Self-alignment of drawers when they are inserted into the switchboard

When the drawer is introduced into the MCC switchboard, either for the withdrawable drawer or for the plug-in, special sliding guides (self-aligning system for connection to the vertical bus) align it to the connection points to the vertical busbars so that the insertion of the pliers (stabs) to the respective fixed sockets on the structure is easy. In a similar way, for withdrawable drawers, the same slides allow similarly easy insertion between mobile and fixed pliers at the drawer exit.



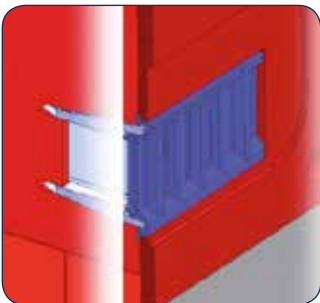
- Fully withdrawable 6" high density drawers

The design for drawers of this size, the smallest, called high density, allows for a high density design that meets UL and NEMA standards by exploiting the advantages in panel sizing and associated costs. The drawer, 6" high, is completely removable as standard and very easy to install and remove.



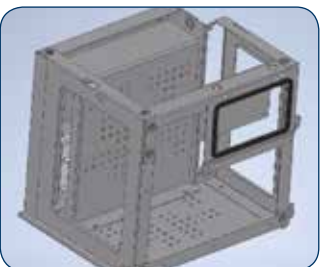
- Silver plated busbar systems as standard

The horizontal and vertical bar systems are silver-plated as standard. Other treatments, such as tinning or nickel plating, are possible at the customer's request.



- Bars and drawers area segregated between them

The horizontal and vertical bar systems are placed at the back of a vertical wall that separates them from the drawers and front fixed cells. On this wall are placed the automatic shutters that allow the connection of the various functional units to the rear vertical bars. The shutters are made of insulating material and in turn installed on insulating plates to ensure additional electrical safety.



- No brand restrictions for electromechanical equipment

In the TQMCC switchboard and drawers can be installed UL products of different brands, available on the market, to better adapt to the preferences that will expose the customer in this sense.

- Fully customisable solutions thanks to 3D design

The design of the TQMCC switchboard has been realised completely in 3D, for every construction element and every detail, thanks to the use of Inventor 2020 software. This will allow us to offer our customers three-dimensional assembly for switchboard configurations already in the offer phase and to customise even the carpentry structures if special dimensions in width or depth are required.

PERFORMANCE PLUSES

The TQMCC switchboard has passed all the tests required by UL 845, but some of these tests have shown that the regulatory limits have even been exceeded.

- **Short-circuit resistance on the bars : time is 1 second.**

The standard (UL 845 - Low Voltage Motor Control Centers) requires that for the test value of 65 KA (Righi Elettroservizi test value) the switchboard and its busbar systems resist at least 50ms to an internal short circuit. The test showed that the bars of the TQMCC switchboard have withstood a value of 65 KA for 1 second, i.e. 20 times longer than required by the standard. The resistance at 65 KA for 1 second applies to all bar configurations provided for this switchboard (600-1,000-1,250-1,600 A current capacity). In the test, both the smaller section buses and the maximum section buses were tested according to the requirements of UL 845 in point 9.10.3.1.

- **Arc fault test resistance: time is 200 milliseconds.**

The standard (C37.20.7-2017 - IEEE Guide for Testing Switchgear Rated Up to 52 kV for Internal Arcing Faults) requires that for the test value of 65 KA a switchboard and its busbar systems resist at least 100ms to an electric arc caused inside it. The test showed that the TQMCC switchboard has withstood a value of 65 KA for 200 milliseconds, i.e. 2 times longer than required by the standard.

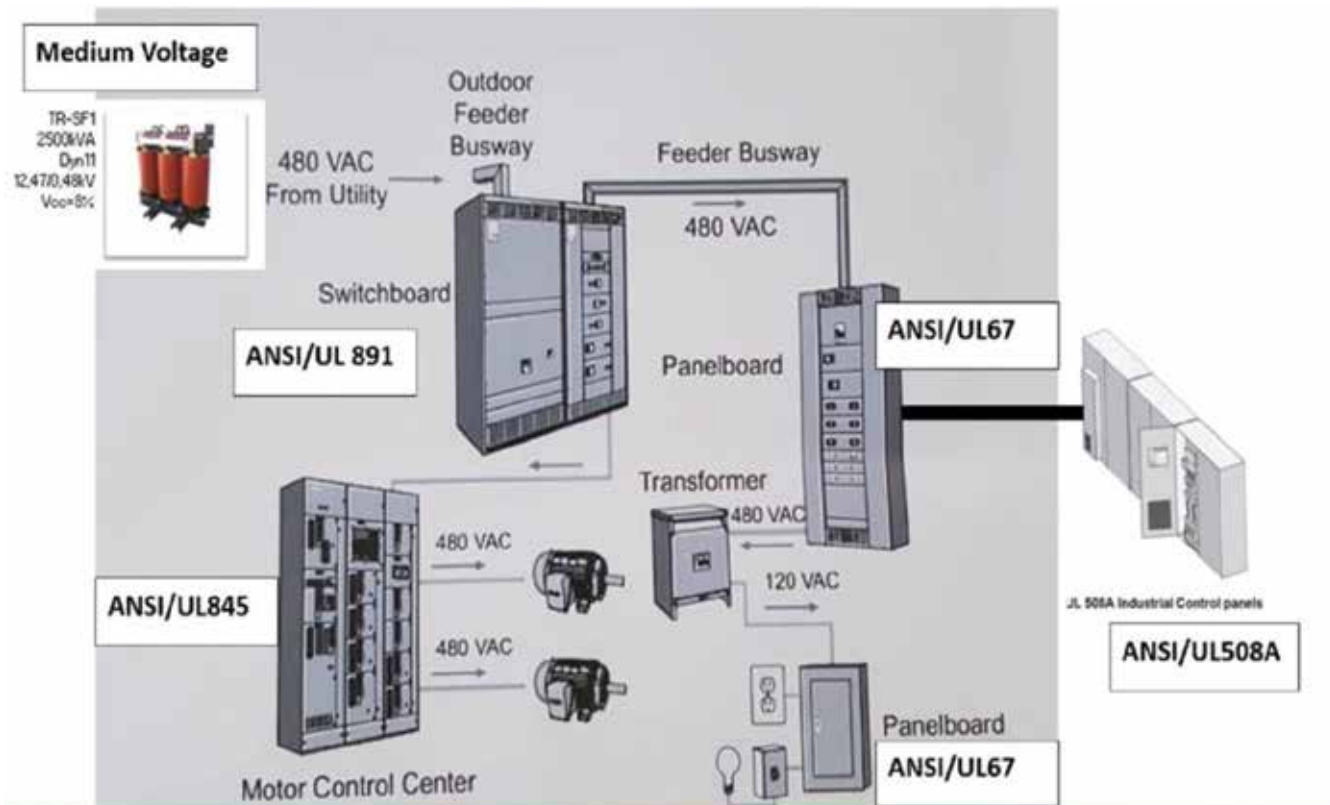
- **Internal arc test (Arc Fault Resistant) switchboard as standard**

The switchboard has been designed and manufactured with internal arc fault solutions as standard. This is an important feature as it offers by default a greater guarantee of security to customers. A non-arc proof version can be supplied on request.

- **Switchboard prepared as standard for “Additional electric arc mitigation system”**

The TQMCC switchboard has been designed and built taking care to prepare all the optical fiber passages and all the allocations for an arc mitigation system that cuts the arc wave within 50ms in case of failure. During the laboratory tests carried out at the IPH (Institut Prüffeld für elektrische Hochleistungstechnik GmbH) in Berlin and at the same time as the internal arc mitigation test, the test of an “electric arc mitigation system” was simulated by triggering an external switch not connected to the switchboard and verifying with appropriate instrumentation the opening times at the stroking of the arc, which largely respected the maximum 50ms limit.

The information given in this document only contains general descriptions and/or performance features which may not always specifically reflect those described, or which may undergo modification in the course of further development of the products. The requested performance features are binding only when they are expressly agreed upon in the concluded contract.





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