

ELECTRIC SWITCHBOARDS

TQM multisystem



**STANDARDISED LOW VOLTAGE
ELECTRIC SWITCHBOARD
WITH MODULAR ELEMENTS**



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COMPANY

TQM Multisystem is the trademark of a line of switchboards manufactured by Righi Elettroservizi, a company which has always been specialised in the design and construction of Low Voltage switchboards. Righi Elettroservizi is well-known on the market as a guarantee of quality and reliability of the products offered and due to the wide range that it can propose to meet a variety of plant engineering requirements.

The company image is also promoted by customarily supplying Customers with high level design documentation and assistance. Righi Elettroservizi has long had a quality management system, in order to conduct company processes, to improve the effectiveness and efficiency both in product realization and service provision, to achieve and enhance customer satisfaction and is certified according to standard UNI EN ISO 9001:2015.

All the switchboards of the TQM Multisystem line come from company designs and prototypes and undergo the tests envisioned by national and international standards.

Righi Elettroservizi can boast a long series of work references performed for important national and international Clients. The line of TQM Multisystem Low Voltage switchboards has been used for years in a variety of plant engineering sectors, such as:

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ENVIRONNEMENT

HOSPITALS

POWER STATION

TRANSPORTS

SPECTACLES

TERTIARY

CHEMICAL INDUSTRY

OIL INDUSTRY

PLASTIC INDUSTRY

STEEL INDUSTRY

ALIMENTARY INDUSTRY

CEMENT AND BRICKS INDUSTRY

GLASS INDUSTRY

WOOD INDUSTRY

PAPER INDUSTRY

LEAD BATTERY RECYCLING INDUSTRY

TQM MULTISYSTEM IN THE WORLD



TQM Multisystem switchboards have been exported in 25 countries and 4 continents.

EUROPE

MIDDLE EAST

AFRICA

ASIA

TQM MULTISYSTEM

The TQM Multisystem line was studied and designed to provide multiple solutions for all different types of plant engineering issues in the industrial, tertiary and complex system sector, thanks to a wide range of configurations which can be made with standardised compartments.

The line of TQM Multisystem switchboards is the result of the idea of joining together, in a concept of full modularity, answers to a host of requirements linked to Low Voltage distribution which until now required adopting different types of switchboards, each with its own characteristics and each for specific uses.

TQM Multisystem means having different types of switchboards available, which can be used independently or as a single switchboard with different types of built-in functions. Up until now, no switchboard line had offered so many options, at the same time being characterised by extreme simplicity, facilitating the choices of design engineers, reducing workloads on installers and being appreciated by users.

TQM Multisystem puts modularity at the service of extreme design and construction flexibility, and all of this in a product:

- conforming to national and international standards
- which meets safety requirements
- easy to install and with minimum footprint
- able to be expanded simply and immediately
- reliable when service continuity is required
- needing little maintenance

TQM Multisystem offers the following possibilities:

- full modularity
- flexibility
- no brand restriction
- switches in all executions
- easy to install
- facilitated cable connections
- cost-effective
- very little maintenance needed
- personnel safety
- safety against fire
- service continuity
- sturdy construction



STANDARDS APPLIED

The low voltage electric switchboards of the MULTISYSTEM line comply with the following international standards:

- CEI EN 61439-1 (IEC 61439-1)
- CEI EN 61439-2 (IEC 61439-2)



ELECTRIC SWITCHBOARDS

THE MULTISYSTEM LINE OF ELECTRIC SWITCHBOARDS

OVERVIEW OF THE PRODUCTS

SWITCH-BOARD	UTILIZATION	Mobility index	I _{cw}	I _n	H (mm)	P (mm)	L (mm) (basic columns)
MS-MCCS	MCC Switchboard with withdrawable drawers	W W W	≤ 50kA	≤ 1.600A	2300	500	900
MS-MCCH	MCC Switchboard with withdrawable drawers	W W W	≤ 70kA	≤ 1.600A	2300	500	900
MS-MCCF	MCC Switchboard with fixed compartments	W W W W W D F F F	≤ 70kA	≤ 1.600A	2300	500	300-450-600-750-900
MS-AG	Switchboard for automation systems with fixed compartments	F F F	≤ 70kA	≤ 1.600A	2300	500	300-450-600-750-900
MS-D	Distribution and motor control switchboard with removable drawers	W F D	≤ 70kA	≤ 1.600A	2300/ 2100	500/ 800	750
MS-PC1	MCC Switchboard with withdrawable drawers	W W W W W D F F F	≤ 70kA	≤ 1.600A	2300	500	300-450-600-750-900
MS-PC2	Power Center Switchboard with fixed compartments	W W W W W D F F F	≤ 80kA	≤ 4.000A	2300	1000	300-450-600-750-900
MS-PC3	Power Center Switchboard with fixed compartments	W W W W W D F F F	≤ 80kA	≤ 4.000A	2300	1500	300-450-600-750-900



MCC switchboards with withdrawable drawers (MCC-S and MCC-H) of the TQM Multisystem line have also passed the internal arc withstand tests according to the IEC 61641 technical report. The relevant tests were conducted at the CESI-IPH (Institut Prüffeld für elektrische Hochleistungstechnik) laboratory in Berlin and showed that the switchboards withstand an internal arc of 70kA for 0.3 seconds. The IEC 61641 technical report has 7 criteria to assess the internal arc withstand test: the first five assessment criteria regard personal protection, the sixth assesses the integrity of the switchgear, and the last addresses a special operating mode of the switchboard, emergency operation after the failure. MCC switchboards with withdrawable drawers of the TQM Multisystem line meet all seven prior conditions, as proven by test report NO. 00857-14-0307 issued by CESI-IPH Berlin.

COMPANY QUALITY

All the switchboards are manufactured according to the Company Quality System and procedures certified by RINA pursuant to standards UNI EN ISO 9001:2015. The recognition which Righi Elettroservizi has obtained ensures the Customer of an organisation in line with the highest international standards that enable the production of products that are technologically advanced, safe and reliable.

Member of CISQ Federation



The MCC switchboard with withdrawable drawers MS-MCC-H of the TQM Multisystem line has obtained the ACAE-Lovag certification (Lovag Certificate of Conformity No. IT 15.039) for the following main performances:
400V (Ue) – 1.600 A (InA) – 70kA,
1s (I_{cw}) – 690V (Ui) – 6Kv (U_{imp}).



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J49433
POMPA OLIO LUBRIFICAZIONE
RALLA DI CARICO.



GENERAL ADDITIONAL CHARACTERISTICS

Storage conditions

To ensure the best conservation of the functional units, in the case of prolonged storage we recommend storing them in their original packaging, in a dry place protected from rain or sun, at a temperature between -2°C and +40°C.

Degree of protection

The low voltage electric switchboards are normally produced with the following degree of protection:

- Outer surface IP4X/IP41
- Inside the unit IP2X

Painting

The painting is carried out using epoxy powders polymerised at 180°C following treatments of washing, degreasing, phosphatising, and passivation and treatments of demineralised water.

The standard colours for the structure and for the doors are RAL 7035 and RAL 7032.

Other colours are available on request.

The minimum thickness of the painting is 60-70 microns.

Fire safety

The use of insulating materials with a high degree of self-extinguishability and the presence of metallic insulations between the various compartments of the single sections prevent the spreading of fires.

Ventilation

Ventilation of the low voltage electric switchboards of the MULTISYSTEM line is guaranteed by an effective natural air circulation obtained by means of suitable air vents situated on the front, on the back, or at the top of the columns. For applications with:

- high ambient temperatures
- high degree of protection

customised solutions can be supplied to guarantee the necessary ventilation of the internal equipment.

Mechanical structure

The structure of the columns of all the low voltage switchboards of the MULTISYSTEM line consists of:

- base section in pre-galvanised sheet steel
- uprights in pre-galvanised sheet steel
- internal insulations in pre-galvanised sheet steel
- doors in painted sheet steel
- front panel of withdrawable or removable drawers in painted sheet steel
- side closure panels in painted sheet steel

Earthing system

Each unit is complete with the earth circuit (PE) in electrolytic copper that connects the door assembly (or the withdrawable or removable drawers), the insulations, the load-bearing structures, and the inactive metallic parts of the circuit breakers.

Individual testing

All the low voltage electric switchboards of the MULTISYSTEM line undergo individual testing as required by the standards, with the following tests:

- Construction check (visual inspection)
- Mechanical operating check
- Verification of the degree of protection
- Wiring inspection
- Electrical operation test
- Verification of protective measures
- Verification of clearance and creepage distance
- Verification of the effective connection between the exposed conductive parts and the protective circuit
- Test of dielectric properties (main circuit and auxiliary circuit)



POINTS OF STRENGTH

TOTAL
CONFORMITY WITH
NATIONAL AND
INTERNATIONAL
STANDARDS

FULL
COMPLIANCE
WITH SAFETY
REQUIREMENTS

EASY
INSTALLATION
AND MINIMUM
FOOTPRINT

SIMPLE
EXPANDABILITY
FOR ALL
TYPES OF
SWITCHBOARD

LITTLE
MAINTENANCE
REQUIRED

GUARANTEED
RELIABILITY
WHEN SERVICE
CONTINUITY IS
REQUIRED

FULL MODULARITY
BETWEEN
DIFFERENT TYPES
OF SWITCHBOARDS

FLEXIBILITY
OF TECHNICAL
SOLUTIONS

AVAILABILITY OF
SOLUTIONS WITH
WITHDRAWABLE
AND REMOVABLE
DRAWERS

NO BRAND
RESTRICTION OF
MATERIALS IN
IMPLEMENTING
THE DESIGNS

FACILITATED
CABLE
CONNECTIONS

COST-EFFECTIVE
PURCHASE AND
MAINTENANCE

POSSIBILITY
OF CUSTOMER
SOLUTIONS FOR
THE FRAMEWORK
OF FIXED
COMPARTMENT

DESIGNS IN
SEVERAL
LANGUAGES

POSSIBILITY OF
CUSTOMISED
COLOURING
ACCORDING TO
CUSTOMER

OVER 40 YEARS
OF EXPERIENCE IN
THE ELECTRICAL
SWITCHGEAR
SECTOR





920-EK-001

TMO MULTISYSTEM LINE II

MCC SWITCHBOARDS WITH WITHDRAWABLE DRAWERS



MS -MCCS

MS -MCCH

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ELECTRICAL AND MECHANICAL FEATURES							
Rated operational voltage	• up to 690 V						
Rated insulation voltage	• up to 1000V						
Rated impulse withstand voltage	• 8kV						
Test voltage at 50-60Hz for 1 minute	• Power circuits 1890-2500V • Auxiliary circuits 1500-2000V						
Rated frequency	• 50-60 Hz						
Rated short-time current (1s)	<table border="0"> <tr> <td>• MS-MCCS</td> <td>• MS-MCCH</td> </tr> <tr> <td>• up to 50kA</td> <td>• up to 70kA</td> </tr> </table>	• MS-MCCS	• MS-MCCH	• up to 50kA	• up to 70kA		
• MS-MCCS	• MS-MCCH						
• up to 50kA	• up to 70kA						
Rated peak withstand current	<table border="0"> <tr> <td>• MS-MCCS</td> <td>• MS-MCCH</td> </tr> <tr> <td>• up to 121kA</td> <td>• up to 176kA</td> </tr> </table>	• MS-MCCS	• MS-MCCH	• up to 121kA	• up to 176kA		
• MS-MCCS	• MS-MCCH						
• up to 121kA	• up to 176kA						
Internal arc withstand current	• 70kA/1s						
Rated current of busbars	• 800-1.600A ((depth 500mm)/up to 4.000A ((depth 1.000mm)						
Construction shape	• IP4x IP41						
Ambient temperature	• IP20						
Industrial pollution degree	• 4b						
Temperatura ambiente	• -5°C + 40°C						
Grado di inquinamento industriale	• 3						
Accessibility	• Front (depth 500mm) / front and rear (depth 1,000mm)						
Dimensions of compartments with withdrawable drawers	<table border="0"> <tr> <td>Depth</td> <td>• 500mm / 700mm / 1.000mm</td> </tr> <tr> <td>Height</td> <td>• 2.300mm</td> </tr> <tr> <td>Width</td> <td>• 900mm</td> </tr> </table>	Depth	• 500mm / 700mm / 1.000mm	Height	• 2.300mm	Width	• 900mm
Depth	• 500mm / 700mm / 1.000mm						
Height	• 2.300mm						
Width	• 900mm						
Dimensions with combined fixed compartments	<table border="0"> <tr> <td>Depth</td> <td>• 500mm / 1.000mm</td> </tr> <tr> <td>Height</td> <td>• 2.300mm</td> </tr> <tr> <td>Width</td> <td>• 300-450-600-750-900mm</td> </tr> </table>	Depth	• 500mm / 1.000mm	Height	• 2.300mm	Width	• 300-450-600-750-900mm
Depth	• 500mm / 1.000mm						
Height	• 2.300mm						
Width	• 300-450-600-750-900mm						





MCC SWITCHBOARDS WITH WITHDRAWABLE DRAWERS



MS -MCCS

MS -MCCH



CHARACTERISTICS COMMON TO THE SWITCHBOARDS

- **Structure of the switchboard**

Each section is made with a series of vertical and horizontal elements (uprights and side panels) in hot galvanised sheet steel. The structure is self-supporting for floor fastening. The internal parts are also made of galvanised sheet steel. The internal partitions and the withdrawable drawers are made of hot galvanised sheet steel. The section closures (doors, cover plates) are made of hot rolled and painted sheet steel.

The equipment zone constitutes the main part of a base section. The useful height is divided into 12 modules. Each functional unit (in a withdrawable drawer) occupies a whole number of modules based on the type and rated current of the equipment.

- **Main busbar compartment**

The system of main busbars (horizontal) is situated in the upper part of the sections, in its own zone metallically insulated, and is accessible from the roof. This system distributes current to the various sections that make up the electric switchboard. All the sections can receive the same horizontal busbars. The connection of the busbars of the groups of sections to be coupled is made using standardised elements.

- **Distribution busbar compartment (rear)**

The system of distribution busbars (vertical) is situated on the back of the equipment zone and is protected in a completely insulated metallic sheath. This system distributes current to the withdrawable drawers of one section. The profile of the busbars is designed to allow the direct insertion of the pliers of the withdrawable drawers. The busbars are made of silvered bare copper and have a rated current of 800A. The MULTISYSTEM MS-MCCS MSMCCH switchboards are the only switchboards with withdrawable drawers that can have the system of vertical busbars removable from the front with switchboards installed.

CHARACTERISTICS COMMON TO THE SWITCHBOARDS

• Manoeuvre and interlocks of the withdrawable drawers

The manoeuvres of inserting and withdrawing the drawers are carried out manually and do not require tools or levers. Each drawer is equipped with electrical and mechanical interlocks to provide all the functions of operating safety. When the drawer is inserted, the mechanism of the circuit breaker of the main circuit can be locked in the open position with padlocks (up to 3 padlocks).

Each drawer can assume the following positions and conditions:

- Inserted position: the power circuits and auxiliary circuits are connected electrically.

- Test condition: with the drawer inserted, acting on the drawer handle, the power circuit is cut off and open while, by means of a double limit switch, the auxiliary circuit is disconnected and subsequently repowered once the power is open. In this position, the manoeuvring element of the power circuit breaker can be locked with padlocks (up to 3 padlocks).

- Cut off position in compartment: the drawer is advanced by approximately 4 cm so that both the power circuits and the auxiliary circuits are disconnected. In this position it is possible to open the front door in complete safety. Also in this position, the manoeuvring element of the power circuit breaker can be

locked with padlocks (up to 3 padlocks).

- Cut off and advanced position in compartment: the drawer is advanced by another 25 cm (obviously, both the power and auxiliary circuits are disconnected). In this position it is possible to inspect the inside of the drawer while it rests on the structure of the compartment.

- Extracted position: to completely withdraw the drawer, it is necessary to release a lever inside the drawer, which is easily accessible, and pull the drawer from the switchboard. The inside lever is a fall-proof safety lock to prevent the drawer from being free to withdraw without stops on the advancement travel.

• Power connections compartment (front)

The cables compartment, accessible from the front part by means of a hinged door, is positioned on the left side of each single column and houses the power cables and auxiliary cables, which are joined respectively to the power connections (protected by a removable transparent cap) and to the auxiliary terminal blocks combined with the withdrawable drawers for the entire height of the column.



• Withdrawable drawers

Each drawer is a completely withdrawable unit, complete with power and auxiliary pliers, upstream and downstream, that contains the electrical components necessary for the control of the user.

The withdrawable drawers are modular. They are available in 4 modules:

- 1/12 · 2/12 · 3/12 · 4/12.

In a column all the combinations of drawers can be fitted up to 12/12. The modular concept allows modifications with respect to the initial configuration of the drawers even with the switchboard under live voltage, with the simple extraction and repositioning of the drawer. Automatic shutters insulate the power busbars upstream following the extraction of the moving part. The shutters are composed of a system of special insertion openings that create the protection against accidental contacts (IP41).

All the withdrawable drawers have a "test" condition. In this condition, the power circuits are open upstream. It is therefore possible to check the operation of the auxiliary circuits.

• The incoming pliers of the withdrawable drawers

The incoming pliers of the withdrawable drawers are engaged on the rear busbar system by means of shutters with automatic opening and closing. They can be 3- or 4-pole with standard rated current of 250A. The pliers can be fitted in parallel in the drawers in order to have rated currents up to 400A.

• The outgoing pliers of the withdrawable drawers

The outgoing pliers can be 3- or 4-pole with rated current of 125A or 400A. Each outgoing plier has a large number of auxiliary terminals (26 for size 1 drawers and up to 52 for drawers of sizes 2, 3 and 4).

MCC SWITCHBOARDS WITH FIXED COMPARTMENTS



MS -MCCF

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ELECTRICAL AND MECHANICAL DATA	
Rated operational voltage	• up to 690 V
Rated insulation voltage	• up to 1000V
Rated impulse voltage	• 8kV
Test voltage at 50-60Hz (5s)	• power circuits 1890-2500V • auxiliary circuits 1500-2000V
Rated frequency	• 50-60 Hz
Rated short-time current (1s)	• up to 70kA
Rated peak withstand current	• up to 154kA
Horizontal busbar rating	• up to 1.600A
Degree of protection (external)	• IP4x IP41
Degree of protection (internal)	• IP20
Form (internal separation)	• 2a, 2b, 3a, 3b, 4a, 4b
Ambient temperature	• -5°C + 40°C
Pollution degree	• 3
Access	• front/rear or front only
Dimensions of the sections	
depth	• 500mm
height	• 2.300mm
width	• 300-450-600-750-900mm



STRUCTURE OF THE SWITCHBOARD

• Circuit breaker compartments/ Motor start compartments

The circuit breaker or motor start compartments, situated in the front part of the switchboard and accessible by a hinged door (with or without door lock depending on the construction type used), can house one or more circuit breakers of the air, moulded-case or modular type for power distribution and all the types of startings for motor control. The circuit breakers installed inside the compartment can be in the

fixed, removable, or withdrawable version. The motor starting can be direct, reversing, star-delta, with inverter starting or softstarter. These switchboards are also optimally suited to house automation systems (e.g. PLCs).

• Instrument compartments

The instrument compartments are situated in the front part of the switchboard and are accessible by means of a hinged door. They can contain measurement instruments and equipment, protection relays, control

and signalling devices.

This auxiliary equipment can also be installed in the circuit breaker compartments to create an all-in-one type functional unit.

• Main busbar compartment

The main busbars are normally situated in the upper part of the columns, in an insulated compartment, and can be inspected after removing the top panels of the columns. They distribute the power supplies to the secondary distribution busbars.



- **Distribution busbar compartment (rear or lateral)**

In these types of switchboards, the distribution busbars can be installed in an insulated rear compartment of the section or in an autonomous and insulated lateral section communicating with the section where the circuit breakers are installed. This flexibility of installation permits configurations that are extremely adaptable to the characteristics of the specific switchboard room.

- **Power connections compartment**

The cables compartments are autonomous sections lateral to the section of the power and auxiliary equipment, and are of width variable from 300 mm to 600 mm, in particular in order to account for the cross-section of the connection cables coming into the switchboard, the adequate bending radii of the cables and their correct connection to the functional unit. The cable compartments also contain the earth bars (PE) to which the protective conductors coming into the single functional units are joined.



DISTRIBUTION AND MOTOR CONTROL SWITCHBOARDS WITH REMOVABLE DRAWERS



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The MULTISYSTEM MS-D switchboards are a brand new entry in the panorama of low voltage switchboards. They are switchboards for distribution and motor control with removable drawers featuring extreme dimensional compactness along with a high level of performance. The removable drawers make it possible to maintain the same flexibility as the switchboards with withdrawable drawers, as it is possible at any time to vary the configuration of the switchboard with the addition of drawers or to modify their positions, without cutting power to the switchboard. The optimisation of the assembly spaces inside the drawers makes it possible to limit the dimensions of the switchboard and to exploit each column to the maximum. These features help to reduce the assembly spaces in the switchboard room and lower the costs of the switchboard and the installations.

ELECTRICAL AND MECHANICAL DATA	
Rated operational voltage	• up to 690 V
Rated insulation voltage	• up to 1000V
Rated impulse voltage	• 8kV
Test voltage at 50-60Hz (1 minute)	• power circuits 1890-2500V • auxiliary circuits 1500-2000V
Rated frequency	• 50-60 Hz
Rated short-time current (1s)	• up to 70kA
Rated peak withstand current	• up to 154kA
Horizontal busbar rating	• 630-800-1.600A (depth 500/800mm) / up to 4.000A (depth 1.000mm)
Degree of protection (external)	• IP4x IP41
Degree of protection (internal)	• IP20
Form (internal separation)	• 3b
Ambient temperature	• -5°C + 40°C
Pollution degree	• 3
Access	• front (depth 500/800mm) / front/rear (depth 1.000mm)
Dimensions of the sections (with removable drawers)	
depth	• 500mm / 800mm / 1.000mm
height	• 2.100mm / 2.300mm
width	• 750mm
Dimensions of the sections combined (with fixed compartments)	
depth	• 500mm / 800mm / 1.000mm
height	• 2.100mm / 2.300mm
width	• 300-450-600-750-900mm





DISTRIBUTION AND MOTOR CONTROL SWITCHBOARDS WITH REMOVABLE DRAWERS

TQM
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MS-D



The MULTISYSTEM MS-D switchboard allows the bank mounting of:

- combinations of motor starters
- moulded-case circuit breakers up to 250A
- miniature circuit breakers

The modular concept enables modifications to the initial configuration of the drawers even when the switchboard is powered, by simply removing and re-positioning the drawer. The compactness of the switchboard makes it possible to reduce the dimensions of a traditional switchboard with fixed compartments by 20-30%.

As an example, a column with dimensions of 750x2300x500 (LxHxD) can house up to 20 removable drawers for controlling direct start motors with power up to 15kW.

The modularity of the MS-D switchboards enables various types of installation to adapt to the configurations of the switchboard rooms.

- the columns can be positioned side by side or back to back
- the columns can be positioned against a wall
- front access to the cable connection zones
- arrival of cables can be from below (switchboards with depth 500mm) or above (switchboards with depth 500+300=800mm)



STRUCTURE OF THE SWITCHBOARD

Each section is made with a series of vertical and horizontal elements (uprights and side panels) in hot galvanised sheet steel. The structure is self-supporting for floor fastening. The internal parts and the removable drawers are also made of galvanised sheet steel. The front door is transparent: the frame is made of hot rolled and painted sheet steel on which a sheet of transparent polycarbonate is mounted to permit complete internal visibility of the equipment situated on the front of the drawers (lighted indicators, controls, protection and measurement instruments, etc.)

The closure panels of the sections (side and rear), as well as the front parts of the drawers, are made of hot rolled and painted sheet steel. The equipment zone constitutes the main part of a base section. The useful height is divided into modules (MS-D switchboards, height 2300mm) or 18 modules (MS-D switchboards, height 2100mm).

Each functional unit (in a removable drawer) occupies a whole number of modules (from one 1 to 5) based on the type and rated current of the equipment. In addition to the removable drawers, it is possible to assemble fixed compartments on the MS-D columns, each with its own door. In the MULTISYSTEM MS-D switchboards, the terminal block and incoming cable zones are integrated in the base column 750mm wide. On request, for cables of greater cross-section, additional cable housing columns can be coupled (300 or 450mm wide).

• Main busbar compartment

The system of main busbars (horizontal) is situated in the upper part of the sections, in its own insulated zone, and is accessible from the roof. This system distributes current to the various sections that make up the electric switchboard. All the sections can receive the same horizontal busbars. The connection of the busbars of the groups of sections to be coupled is made using standardised elements. The main horizontal busbars are made of bare copper (with surface treatments on request).

• Distribution busbar compartment

The system of distribution busbars (vertical) is situated on the back of the equipment zone and is protected in a completely insulated metallic sheath. This system distributes current to the removable drawers of one section. The profile of the busbars is designed to allow the direct insertion of the pliers of the removable drawers. The busbars have a rated current of 800 A (for switchboards 500mm deep) or 1400 A (for switchboards 800mm deep). The MULTISYSTEM MS-D switchboards are the only switchboards with removable drawers that can have the system of vertical busbars removable from the front with switchboards installed.

• Composition of the removable drawers

The removable drawers have a mobility index of WFD (connection pliers upstream, modular terminal blocks downstream, connectors for auxiliary circuits). All the control, protection, and signalling equipment combined with the user to be powered is contained inside the drawer. So the addition of a user, even subsequently, to a switchboard in operation can be done very quickly (a few seconds) without taking the switchboard out of service. The installer only has to make the external connection of the cables. The front width of the drawers is 450mm.

The vertical modularity of the drawers is 100 mm:

- drawer 1 module : 100mm
- drawer 2 modules : 200mm
- drawer 3 modules : 300mm
- drawer 4 modules : 400mm
- drawer 5 modules : 500mm

Each drawer is composed of:

- frame in galvanised sheet steel
- power pliers upstream (3 or 4 poles) 250 A
- mechanical protection of the incoming pliers
- support shelf in galvanised sheet steel with runner guides
- safety system that impedes drawer removal when the circuit breaker or switch-disconnector is closed, with

interlock of the rotary handle on the structure of the column

- openable control and signalling panel on the front of the drawer in thermoplastic material, for installing the control, signalling, measurement or protection equipment
- external door in sheet metal, openable following the opening of the switch-off element (circuit breaker or switch-disconnector)
- internal mounting plate for the power equipment
- internal DIN rails for auxiliary equipment
- pre-drilled right wall for mounting the auxiliary connectors
- internal safety lever (fall prevention)
- two ergonomic handles for drawer movement

• Incoming pliers and automatic shutters

The power pliers incoming to the removable drawers engage on the rear busbar system by means of shutters with automatic opening and closing. They can be 3- or 4-pole with standard rated current of 250A. The connected contacts are silver-plated.

The automatic shutters comprise an insertion system that provides protection against accidental contacts (IP41), and thus insulate the vertical power busbars following removal of the drawer.



QUADRI DI DISTRIBUZIONE E COMANDO MOTORI A CASSETTI ASPORTABILI

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MS-D

• Power connections outgoing from the drawer

The drawers are equipped with a mounting plate for modular terminal blocks (integrated with the drawer). The terminal blocks are chosen according to the cross-sections of the power cables coming into the drawer. When the power cables are disconnected (e.g. to remove the drawer), the power terminal blocks are also removed with the drawer.

• Auxiliary circuits outside the drawer

The removable drawers can be equipped with the following connectors for auxiliary circuits:

- drawers 1 module (height 100mm): one or two 6-pole connectors, for conductors up to 4mm²

- drawers 2,3,4,5 modules (height 200/300/400/500mm) from one to four 6-pole connectors, for conductors up to 4mm²

• Controls, signalling, measurement or protection instruments

The front of each drawer is fitted with a control and signalling panel made of thermoplastic material (with screw fastening) to house the control and signalling equipment and any measurement or protection instruments. This panel can be opened for inspection or for making a thermographic check while the user is powered.

There are two types of panels:

type with 5 holes (pre-cut) for drawer module 1

- 1 hole 48x48mm (for measurement instruments or earth leakage relays 48x48mm)
- 4 holes for control or signalling unit Ø 22mm.

type with 10 holes (pre-cut)

- 2 holes 48x48mm (for measurement instruments or earth leakage relays 48x48mm)
- 8 holes for control or signalling unit Ø 22mm.

• Manoeuvre and interlocks of the removable drawers

The manoeuvres of inserting and removing the drawers is carried out manually and do not require special tools or levers. Each drawer is equipped with mechanical interlocks to provide all the functions of operating safety. When the drawer is inserted, the

mechanism of the circuit breaker of the main circuit can be locked in the open position with padlocks (up to 3 padlocks).

Procedure for removing a drawer:

- open the circuit breaker or switch-disconnector
 - disconnect the power cables from the output terminal blocks (which are now unpowered)
 - disconnect the auxiliary connectors
 - pull the drawer up to the safety lock position (fall prevention)
 - lift the internal stop lever
- The drawer can now be removed.

The estimated time for these operations is less than one minute.

Procedure for inserting a drawer:

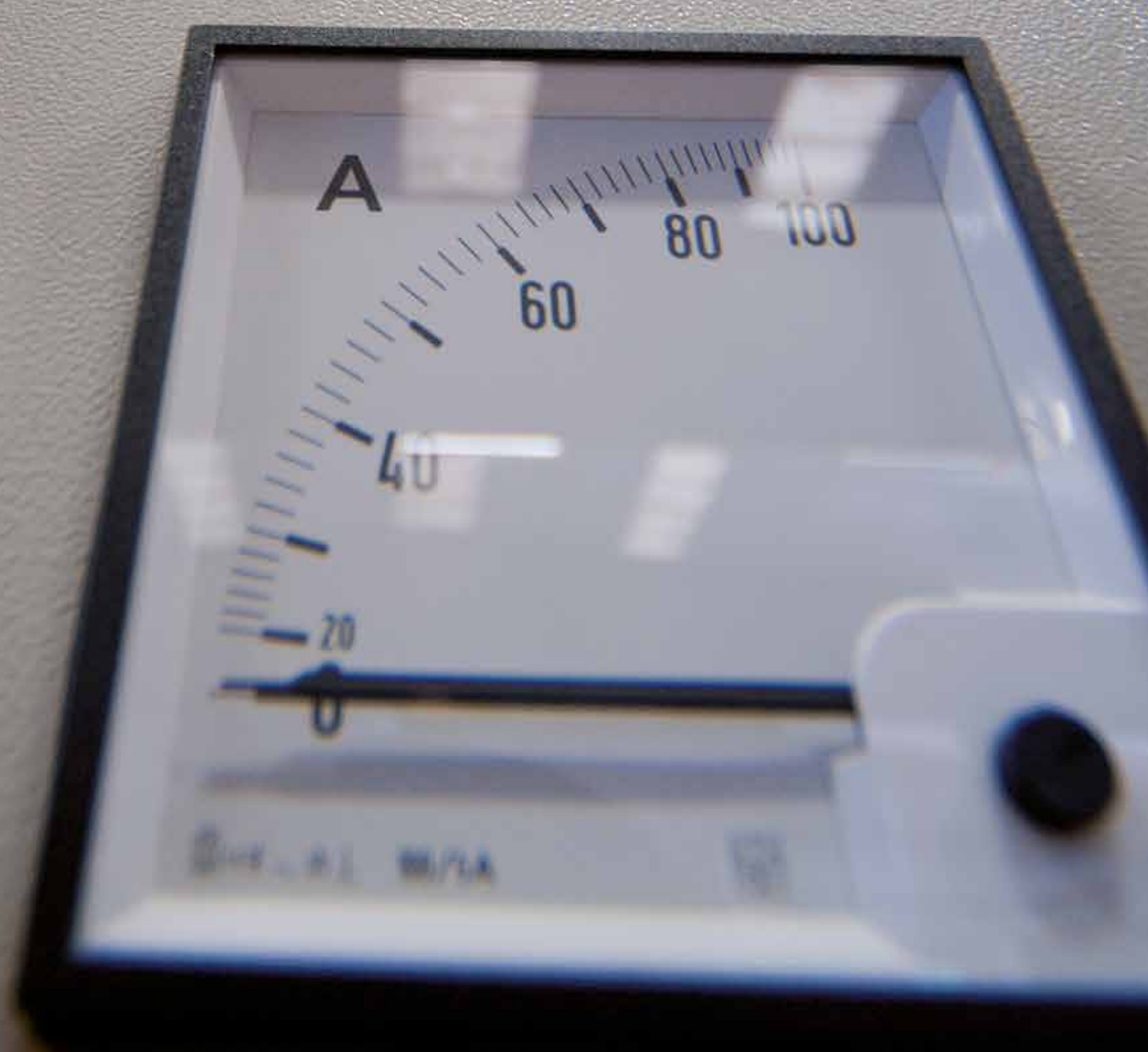
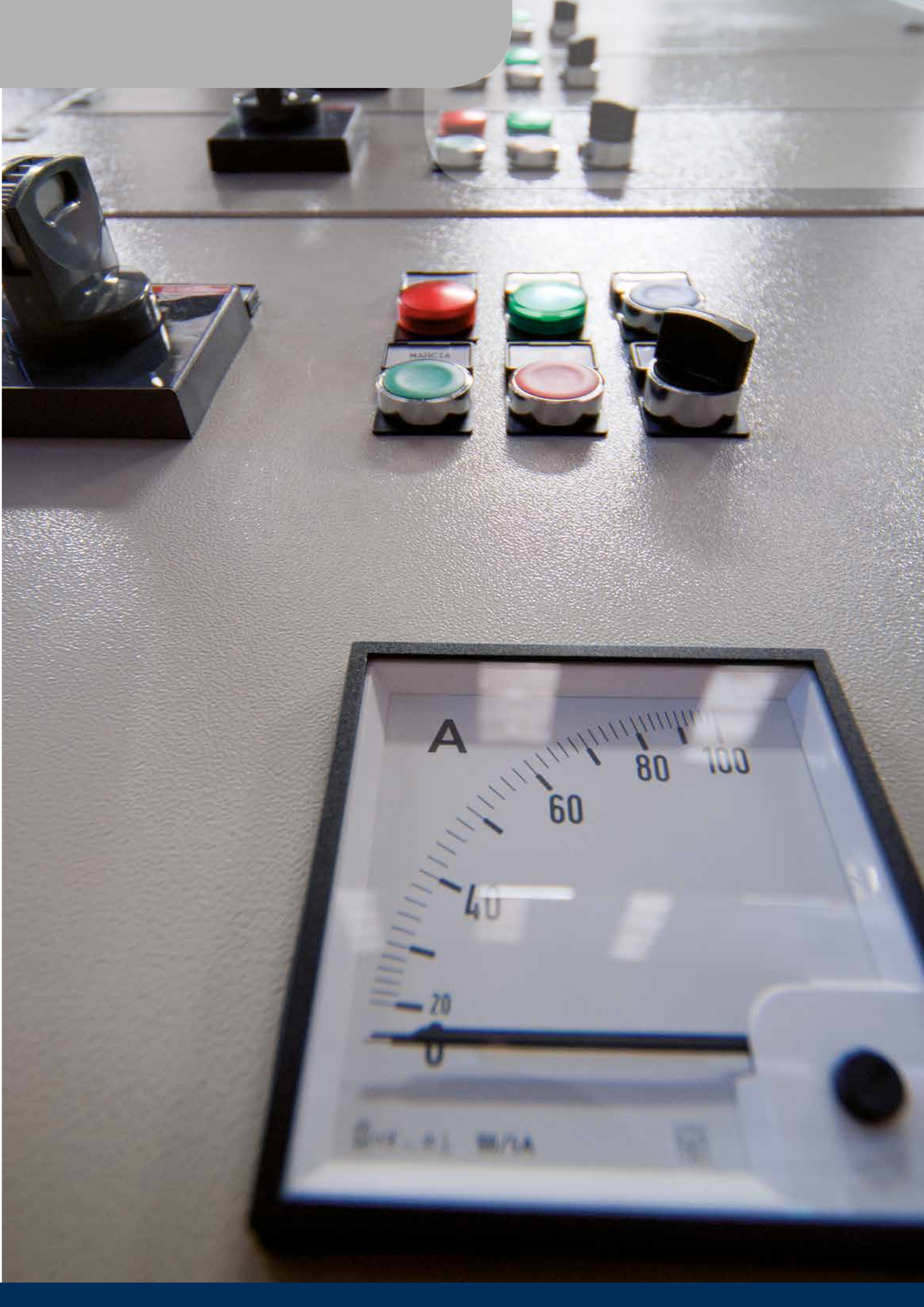
- set the drawer on the running surface mounted on the column
- make sure that the rotary handle of the circuit breaker or switch-disconnector is in the open position
- push the drawer in; it will insert on the system of vertical busbars, located on the bottom, by means of the connection pliers upstream from the drawer

The estimated time for these operations is less than 20 seconds.

To subsequently put the drawer into operation

- connect the power cables to the output terminal blocks, keeping the circuit breaker or switch-disconnector open (rotary handle in the open position)
- connect the auxiliary connectors
- close the circuit breaker or switch-disconnector





ELECTRICAL AND MECHANICAL DATA	
Rated operational voltage	• up to 690 V
Rated insulation voltage	• up to 1000V
Rated impulse voltage	• 8kV
Test voltage at 50-60Hz (1 minute)	• power circuits 1890-2500V • auxiliary circuits 1500-2000V
Rated frequency	• 50-60 Hz
Rated short-time current (1s)	• up to 70kA
Rated peak withstand current	• up to 154kA
Horizontal busbar rating	• up to 1.600A
Degree of protection (external)	• IP4x IP41
Degree of protection (internal)	• IP20
Form (internal separation)	• 2a, 2b, 3a, 3b, 4a, 4b
Ambient temperature	• -5°C + 40°C
Pollution degree	• 3
Access	• front/rear or front only
Dimensions of the sections	
depth	• 500mm
height	• 2.300mm
width	• 300-450-600-750-900mm



STRUCTURE OF THE SWITCHBOARD

• Circuit breaker compartments

The circuit breaker compartments, situated in the front part of the switchboard and accessible by means of a hinged door (with or without door lock depending on the construction type used), can house one or more circuit breakers of the air, moulded-case or modular type. The circuit breakers installed inside the compartment can be in fixed, removable, or withdrawable version.

• Instrument compartments

The instrument compartments are situated in the front part of the switchboard and accessible by means of a hinged door. They can contain measurement instruments and equipment, protection relays, control and signalling devices. This auxiliary equipment can also be installed in the circuit breaker compartments to create an all-in-one type functional unit.

• Main busbar compartment

The main busbars are normally situated in the upper part of the columns, in an insulated compartment, and can be inspected after removing the top panels of the columns. They distribute the power supplies to the secondary distribution busbars.



- **Distribution busbar compartment (rear or lateral)**

In these types of switchboards, the distribution busbars can be installed in an insulated rear compartment of the section or in an autonomous and insulated lateral section communicating with the section where the circuit breakers are installed. This flexibility of installation permits configurations that are extremely adaptable to the characteristics of the specific switchboard room.

- **Power connections compartment**

The cables compartments are autonomous sections lateral to the section of the power and auxiliary equipment, and are of width variable from 300 mm to 600 mm, in particular in order to account for the cross-section of the connection cables coming into the switchboard, the adequate bending radii of the cables and their correct connection to the functional unit. The cables compartments also contain the earth bars (PE) to which the protective conductors coming into the single functional units are joined.



ELECTRICAL AND MECHANICAL DATA	
Rated operational voltage	• up to 690 V
Rated insulation voltage	• up to 1000V
Rated impulse voltage	• 8kV
Test voltage at 50-60Hz (1 minute)	• power circuits 1890-2500V • auxiliary circuits 1500-2000V
Rated frequency	• 50-60 Hz
Rated short-time current (1s)	• up to 80kA
Rated peak withstand current	• up to 176kA
Horizontal busbar rating	• up to 4.000A
Degree of protection (external)	• IP4x IP41
Degree of protection (internal)	• IP20
Form (internal separation)	• 2a, 2b, 3a, 3b, 4a, 4b
Ambient temperature	• -5°C + 40°C
Pollution degree	• 3
Access	• front/rear
Dimensions of the sections	
depth	• 1.000mm
height	• 2.300mm
width	• 300-450-600-750-900mm



STRUCTURE OF THE SWITCHBOARD

• Circuit breaker compartments

The circuit breaker compartments, situated in the front part of the switchboard and accessible by means of a hinged door (with or without door lock depending on the construction type used), can house one or more circuit breakers of the air, moulded-case or modular type. The circuit breakers installed inside the compartment can be in fixed, removable, or withdrawable version.

• Instrument compartments

The instrument compartments are situated in the front part of the switchboard and accessible by means of a hinged door.

They can contain measurement instruments and equipment, protection relays, control and signalling devices. This auxiliary equipment can also be installed in the circuit breaker compartments to create an all-in-one type functional unit.

• Main busbar compartment

The main busbars are situated in the rear part of the columns (space of approximately 500 mm in depth).

They distribute the power supplies to the distribution busbars. They can be positioned, in height, in the upper, middle, or lower part of the columns depending on the geometry of the system of busbars to be created.



• Distribution busbar compartment

The distribution busbars are also situated in the rear part of the columns (space of approximately 500 mm in depth). They distribute the power supplies to the functional units of the switchboard. They can be positioned, in height, in the upper, middle, or lower part of the columns depending on the geometry of the system of busbars to be created.

• Power connections compartment

The power cables compartments can be positioned in the front part for access to the connections from the front, or in the rear part for access to the connections from the back. In both cases they can be insulated to respect the construction design of the switchboard.





ELECTRICAL AND MECHANICAL DATA	
Rated operational voltage	• up to 690 V
Rated insulation voltage	• up to 1000V
Rated impulse voltage	• 8kV
Test voltage at 50-60Hz (1 minute)	• power circuits 1890-2500V • auxiliary circuits 1500-2000V
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Horizontal busbar rating	• up to 4.000A
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Degree of protection (internal)	• IP20
Form (internal separation)	• 2a, 2b, 3a, 3b, 4a, 4b
Ambient temperature	• -5°C + 40°C
Pollution degree	• 3
Access	• front/rear
Dimensions of the sections	
depth	• 1.500mm
height	• 2.300mm
width	• 300-450-600-750-900mm

STRUCTURE OF THE SWITCHBOARD

• Circuit breaker compartments

The circuit breaker compartments, situated in the front part of the switchboard and accessible by means of a hinged door (with or without door lock depending on the construction type used), can house one or more circuit breakers of the air, moulded-case, or modular type. The circuit breakers installed inside the compartment can be in fixed, removable, or withdrawable version.

• Instrument compartments

The instrument compartments are situated in the front part of the switchboard and accessible by means of a hinged door. They can contain measurement instruments and equipment, protection relays, control and signalling devices. This auxiliary equipment can also be installed in the circuit breaker compartments to create an all-in-one type functional unit.

• Main busbar compartment

The main busbars are situated in the middle part of the columns (space of approximately 500 mm in depth). They distribute the power supplies to the distribution busbars. They can be positioned, in height, in the upper, middle, or lower part of the columns depending on the geometry of the system of busbars to be created.



- **Distribution busbar compartment**

The distribution busbars are situated in the rear part of the columns (space of approximately 500 mm in depth). They distribute the power supplies to the functional units of the switchboard. They can be positioned, in height, in the upper, middle, or lower part of the columns depending on the geometry of the system of busbars to be created.

- **Power connections compartment**

The power cables compartments are always positioned in the rear part for access to the connections from the back.



TQM multisystem **MS - MB100**

• Full Service

To complete our range of our products, we offer the following services all over the world:

- Project management and supply of control systems developed by DCS, SCADA, PLC.
- After sale service ;
- Technical advice;
- Training Programs;
- Testing;
- Problem Solving Analysis;
- Installation;
- Commissioning;
- Start-up assistance;
- Software maintenance;
- O&M;
- Spare parts and replacement service.

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MS MB100

- Containment electrical substation MV / LV on prefabricated Unit;
- Containment Unit Power Center;
- Containment Unit MCC;
- Control & Supervision systems on Containment Unit.

Prefabricated cabinet can be customized, also in steel in case of harsh environments area.

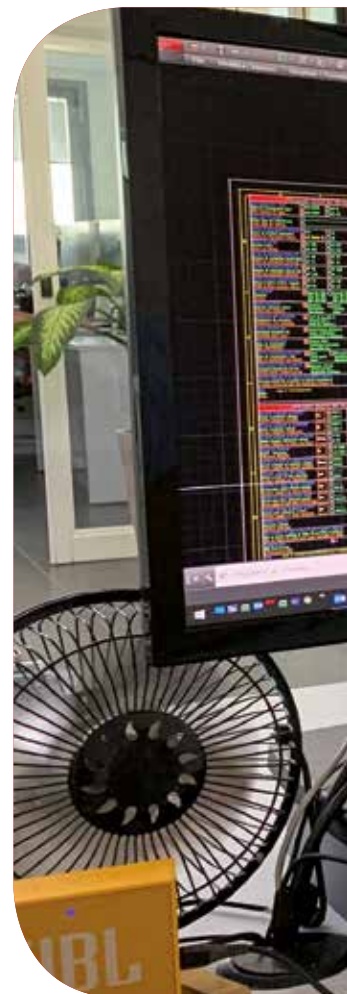
The EPC Contractor, Righi Elettroservizi spa, coordinates and controls every aspect of project, from feasibility studies, cost analysis, design of structural performance optimization, Electrical, HVAC and security systems, procurement, construction, installation, commissioning, shipping costs and final inspection on substations yard site, as well as operational support and maintenance if requested.

Modules are assembled and rigorously tested within Righi's plant (Elettroservizi spa), before delivered by land, air or sea, it's ready for installation and commissioning ('Plug and Work' delivery).

Our experience allows us to design, build and supply modular structures that can be used in multiple configurations, and are designed with the aim to reduce costs and construction time.

The Technical TQM cabinet branded-MS100 / MS102-TQM / TQM-MS103 can be supplied with different characteristics and be customized.

Products are equipped with a software and hardware combination especially designed to control and monitoring power yield and distribution systems.





• Functions

- Equipment control on field, with substation technical drawing
- Data Acquisition from all types of instrument
- Very detailed graphics display and touch-screen interface
- Configuring "set point" Viewing for protection and / or other type of instruments setting
- Immediate supervisor commands transmission
- Integrazione dei processi e del sistema di distribuzione elettrica
- Processes and electrical distribution system Integration
- Precise functionality control
- Failures Recording and consumption for an optimized analysis
- Generic Maintenance management
- Maintenance management on communications networks and components system
- On Line assistance
- Pressurization System
- Thunderbolt protection
- Explosion-proof construction
- Filtration System
- Gas, smoke and fire detection system
- Automatic fire protection system
- Protection and integrated control system
- Remote and monitoring Control



SERVICES



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SPECIAL VERSIONS

TOM Multisystem is able to assist customers in the widest variety of requirements for customising the low voltage switchboards:

- Switchboards for installation in containers
- Switchboards for corner installation
- Switchboards with custom colours
- Switchboards for back-to-back installation
- Switchboards with busbars completely silver-plated or tin-plated or nickel-plated
- Switchboards with busbars completely insulated in shrink- wrapped sheaths (busbar tubing)
- Switchboards with open or closed chassis (for the French market and for installation in cupboards)





TECHNICAL DOCUMENTATION

Each switchboard built by TOM Multisystem is accompanied by complete technical documentation, prepared in collaboration with the customer's technical offices, to guarantee satisfaction of all the product requirements.

Standard technical documentation

The standard technical documentation consists of:

- construction drawing (switchboard front, interior layout, drawing of main and distribution busbars)
- oneline diagram (with tables of materials and factory settings)
- schematic diagrams (with functional details and information)
- equipment list (with references to the project designations)
- list of labels
- test reports (individual tests)
- identity card of the switchboard (data sheet)
- CE declaration of conformity
- instructions for switchboard installation and maintenance
- manuals and instructions for the main equipment installed in the switchboard

Other documentation supplied on request:

- project documents in English, French
- heating calculations
- type test reports
- files of the drawings and of the project documentation (autocad, excel, pdf, etc.)

DOCUMENTATION ON REQUEST

The technical documentation described above can be integrated with other documentation upon customer request to comply with the various prescriptions that may be found in the project specifications supplied by the customer and that must be respected contractually.

CUSTOMERS



THE RELATIONSHIP WITH THE CUSTOMER

To ensure that an electric switchboard, in addition to being constructed in full compliance with the technical standards and the rules of the trade, can fully satisfy the expressed and implicit requirements, for TOM Multisystem the relationship with the customer is crucial, starting right from the moment of the offer. This relationship will then become more specific and detailed in the subsequent phase of product construction. In fact, there are a number of details necessary to ensure the good outcome of the design of an electric switchboard that depend on the information the customer provides to the manufacturer. This information may include, to give a few examples:

- The formation of the cables coming into the switchboard (in order to provide for suitable points of connection to the plant);
- Definition of the entry points (from below, from above, or from both directions) of the cables coming into the switchboard;
- The geometry and characteristics of the incoming elements to the switchboard in the case of busbar trunking;
- The layout of the installation room to verify the correct positioning in the installation spaces;
- The criteria for switchboard moving and handling inside the rooms and the need, where present, to subdivide the switchboard into multiple parts for the purposes of positioning in the rooms (with the definition of the subsequent criteria for re-coupling the parts);
- Definition of the packing criteria to account for the subsequent types of transport (land, sea, etc.)
- Definition of the types of transport and the indication of the delivery points.

It is clear, then, that there are a number of aspects that indicate how the quality of the electric switchboard and its full responsiveness to the needs of the specific installation



depend on an effective relationship between the customer and the manufacturer. The standards, moreover, help to define a series of parameters that are part of this collaboration between the customer and the manufacturer, as aspects to be defined to ensure the perfect outcome of the work.

Here is a list of some of these aspects:

- Rated diversity factor
- Use of electronic equipment at altitudes greater than 1000 m
- Special operating conditions
- Electrical and irradiated interference
- Conditions of transport, storage, and installation
- Terminals for external conductors
- Degree of protection required for the installation
- Choice of the measure of protection from direct contacts
- Choice of the measure of protection from indirect contacts
- Accessibility during service for authorised personnel
- Accessibility for inspection and analogous operations
- Accessibility for maintenance
- Accessibility for expansion with the equipment under live voltage
- Values of the prospective short circuit current
- Degree of protection after removal of a moving or withdrawable part
- Forms of internal separation
- Variations of the absorbed voltage for power supply to electronic equipment
- Variation of the power supply frequency.

The TOM Multisystem Technical Offices can assist customers in defining all the characteristics of the product and provide them with all the contributions necessary for the complete technical definition of the electric switchboards.

LOW VOLTAGE SWITCHBOARDS FOR THE NORTH AMERICAN MARKET



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





of the switchboard can also be made in prefabricated busbar duct, thus facilitating the installation of the TQM 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 TQM 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**

TQM 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

LOW VOLTAGE SWITCHBOARDS FOR THE NORTH AMERICAN MARKET



UL891 EVOLUTION

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 TQM 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.



LOW VOLTAGE SWITCHBOARDS FOR THE NORTH AMERICAN MARKET



UL845

LOW VOLTAGE MOTOR
CONTROL CENTER

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



LOW VOLTAGE SWITCHBOARDS FOR THE NORTH AMERICAN MARKET



UL845

LOW VOLTAGE MOTOR
CONTROL CENTER

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

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

FEATURES

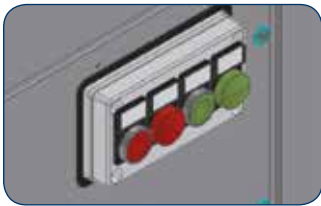
- **Standard finish**

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.



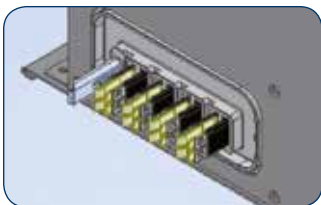
- **Withdrawable units**

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.



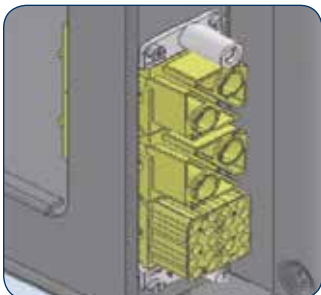
- **Frontal push-button panel integral with the inner case**

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.

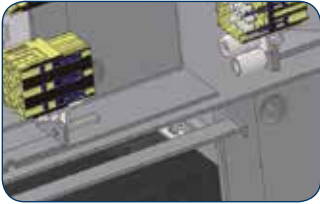
LOW VOLTAGE SWITCHBOARDS FOR THE NORTH AMERICAN MARKET



UL845

LOW VOLTAGE MOTOR
CONTROL CENTER

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.



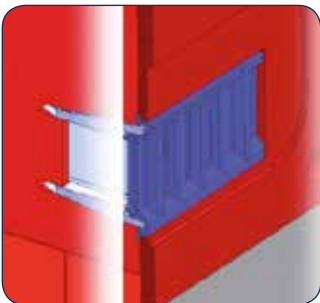
- Fully withdrawable 6" high density drawers

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.



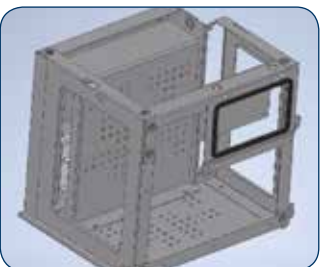
- Silver plated busbar systems as standard

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 TOMCC 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 TOMCC 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 TOMCC switchboard has withstood a value of 65 KA for 200 milliseconds, i.e. 2 times longer than required by the standard.

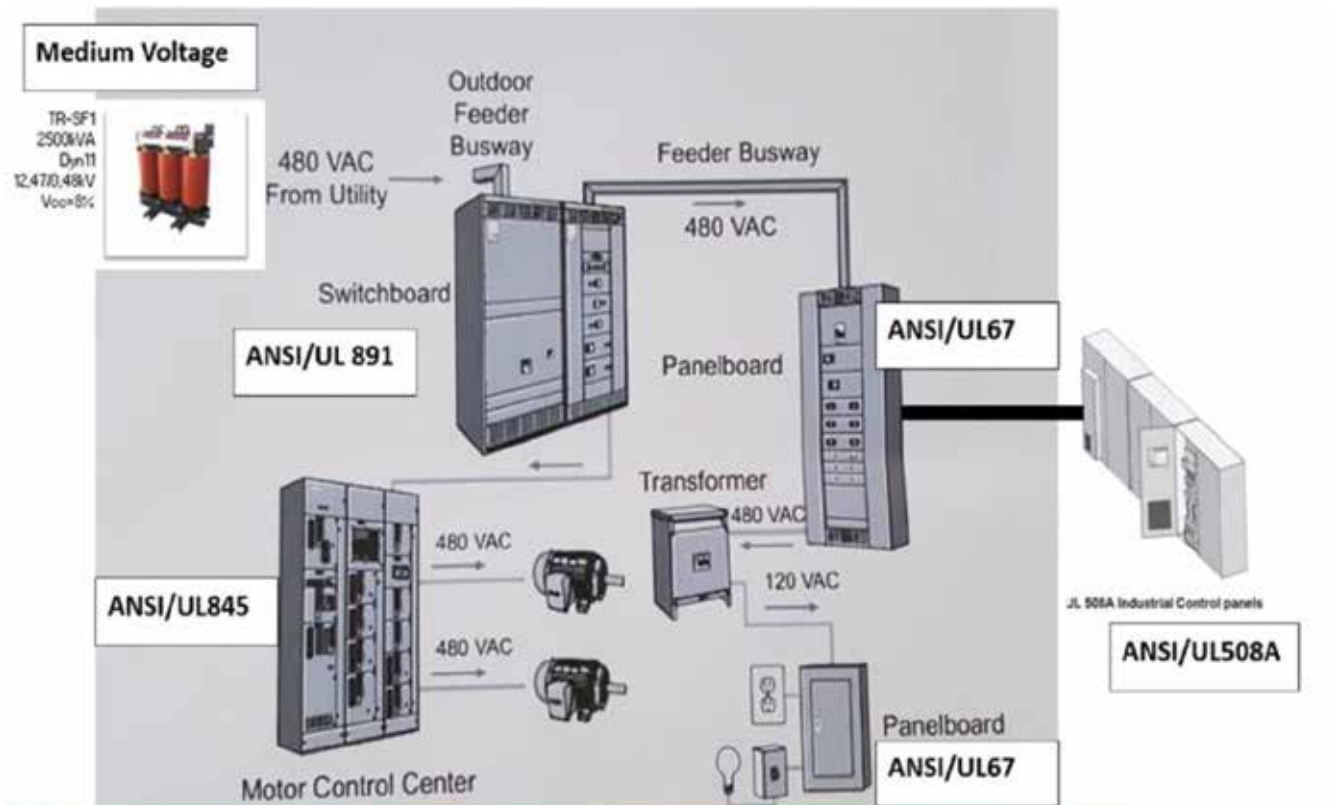
- **Internal arc test (Arc Fault Resistant) switchboard as standard**

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 TOMCC 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.





TQM
multisystem

STANDARDISED LOW VOLTAGE ELECTRIC SWITCHBOARD WITH MODULAR ELEMENTS



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