STANDARDISED LOW VOLTAGE ELECTRIC SWITCHBOARDS WITH MODULAR ELEMENTS
Our company has always specialised in the design and construction of low voltage switchboards. TQM Multisystem is well-known on the market as a guarantee of quality and reliability of the products offered and for the vast range proposed to respond to the widest variety of plant engineering requirements. The corporate image has also been enhanced by the practice of providing customers with high quality project documentation. TQM Multisystem is a UNI EN ISO 9001:2008 certified company. All the switchboards produced by TQM Multisystem are developed from in-house designs and prototypes subjected to the full range of tests prescribed by the national and international standards. TQM Multisystem boasts a long list of references for projects carried out on behalf of important national and international customers. We specialise in the design and production of electric switchboards for the following sectors:

- Environment
- 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 switchboards have been exported in 25 countries and 4 continents.
The low voltage electric switchboards in the TQM Multisystem line are composed of standardised modular units that can be installed side-by-side, even different types, separated by metallic insulations that can cover all the construction forms required by the standards. They can also be produced in a wall-mount version when required by the specific installation needs.

Thanks to their particular characteristics, MULTISYSTEM low voltage electric switchboards are ideal for providing solutions designed to adapt to any requirement, guaranteeing continuity of service, personnel safety, and the possibility to integrate the switchboard into the supervision and control system. The versatility of low voltage electric switchboards makes them suitable for the widest variety of installations in important electrical plants, including:

- Industrial (cementworks, petrochemical, metallurgical, paper)
- Production and distribution of electrical energy (power plants, substations, cogeneration, alternative energies)
- Infrastructures (railroads, subways, airports)

TQM Multisystem switchboards have been exported in 25 countries and 4 continents.
The low voltage electric switchboards of the MULTISYSTEM line comply with the following international standards:

- CEI EN 60439-1 (IEC 60439-1)
- CEI EN 60439-2 (IEC 60439-2)
- CEI EN 61439-1 (IEC 61439-1)
- CEI EN 61439-2 (IEC 61439-2)
# THE MULTISYSTEM LINE OF ELECTRIC SWITCHBOARDS

## Overview of the products

<table>
<thead>
<tr>
<th>SWITCHBOARD</th>
<th>UTILIZATION</th>
<th>Service Index (*)</th>
<th>Mobility Index</th>
<th>Icw</th>
<th>In</th>
<th>H (mm)</th>
<th>P (mm)</th>
<th>L (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS-MCCS</td>
<td>MCC Switchboard with withdrawable drawers</td>
<td>IS333</td>
<td>WW W</td>
<td>≤ 50kA</td>
<td>≤ 1.600A</td>
<td>2300</td>
<td>500</td>
<td>900</td>
</tr>
<tr>
<td>MS-MCCH</td>
<td>MCC Switchboard with withdrawable drawers</td>
<td>IS333</td>
<td>WW W</td>
<td>≤ 70kA</td>
<td>≤ 1.600A</td>
<td>2300</td>
<td>500</td>
<td>900</td>
</tr>
<tr>
<td>MS-MCCF</td>
<td>MCC Switchboard with fixed compartments</td>
<td>IS222 IS223</td>
<td>WW W WW D WW D</td>
<td>≤ 70kA</td>
<td>≤ 1.600A</td>
<td>2300</td>
<td>500</td>
<td>300-450-600-750-900-1200</td>
</tr>
<tr>
<td>MS-AG</td>
<td>Switchboard for automation systems with fixed compartments</td>
<td>IS111</td>
<td>F F F</td>
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<td>≤ 1.600A</td>
<td>2300</td>
<td>500</td>
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</tr>
<tr>
<td>MS-D</td>
<td>Distribution and motor control switchboard with removable drawers</td>
<td>IS223</td>
<td>W F D</td>
<td>≤ 70kA</td>
<td>≤ 1.600A</td>
<td>2300/2100</td>
<td>500/800</td>
<td>750</td>
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<tr>
<td>MS-WP</td>
<td>Power Center Switchboard with withdrawable drawers</td>
<td>IS333</td>
<td>WW W</td>
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<td>≤ 4.000A</td>
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<td>1000/1300</td>
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<td>MCC Switchboard with withdrawable drawers</td>
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<td>500</td>
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<tr>
<td>MS-PC2</td>
<td>Power Center Switchboard with fixed compartments</td>
<td>IS222 IS223</td>
<td>WW W WW W W D WW D WW D</td>
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<td>≤ 4.000A</td>
<td>2300</td>
<td>1000</td>
<td>300-450-600-750-900-1200</td>
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<tr>
<td>MS-PC3</td>
<td>Power Center Switchboard with fixed compartments</td>
<td>IS222 IS223</td>
<td>WW W WW W W D WW D WW D</td>
<td>≤ 80kA</td>
<td>≤ 4.000A</td>
<td>2300</td>
<td>1500</td>
<td>300-450-600-750-900-1200</td>
</tr>
</tbody>
</table>

All the types of switchboards in the MULTISYSTEM line can be assembled together. Combining the various types of switchboards can raise the current capacities indicated in the table. In this regard, see also the electrical and dimensional characteristics of the various types of switchboards illustrated on the following pages.

## Company quality

All the electric switchboards are produced according to the Quality System and the company procedures certified by the organisation RINA according to the UNI EN ISO 9001:2008 standards. This certification assures the customer that TQM Multisystem has an organisation in line with the highest international standards that enable the production of products that are technologically advanced, safe and reliable.

(*) Service Index SI

The Service Index [SI] is a selection parameter of choice standardised on the French market, with the purpose of determining in a simple and precise manner the type of LV distribution or motor control switchboard that best responds to the customer’s needs. In France the service index is indispensable for preparing tender offers. It guarantees the level of service in relation to the operations of control, maintenance, and evolution of the switchboard.

MULTISYSTEM switchboards can have a service index from 111 to 333 depending on the type of section.
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)
The strong points
OF THE MULTISYSTEM TQM

| Quality | ✔ |
| Reliability | ✔ |
| Competitive price | ✔ |
| Flexible configurations | ✔ |
| Compact size | ✔ |
| Standardised system | ✔ |
| Easy assembly and wiring | ✔ |
| Fast delivery | ✔ |

Advantages
OF THE MULTISYSTEM TQM

The MULTISYSTEM line of low voltage electric switchboards puts modularity at the service of extreme flexibility of design and installation, all this in a product that is
- compliant with the national and international standards
- responsive to safety requirements
- easy to install, with a minimum footprint
- expandable in a simple and immediate manner
- reliable in installations requiring service continuity
- low maintenance

MULTISYSTEM means
- total modularity
- flexibility
- no brand restrictions
- circuit breakers in all versions
- easy installation
- facilitated cable connections
- economy
- very low maintenance
- personnel safety
- safety against fire
- continuity of operation
- sturdy construction
## Electrical and Mechanical Data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated operational voltage</td>
<td>up to 690 V</td>
</tr>
<tr>
<td>Rated insulation voltage</td>
<td>up to 1000 V</td>
</tr>
<tr>
<td>Rated impulse voltage</td>
<td>8 kV</td>
</tr>
<tr>
<td>Test voltage at 50-60Hz (5s)</td>
<td>• power circuits 1890-2500 V</td>
</tr>
<tr>
<td></td>
<td>• auxiliary circuits 1500-2000 V</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>50-60 Hz</td>
</tr>
<tr>
<td>Rated short-time current (1s)</td>
<td>up to 50kA</td>
</tr>
<tr>
<td>Rated peak withstand current</td>
<td>up to 121kA</td>
</tr>
<tr>
<td>Horizontal busbar rating</td>
<td>up to 800-1600A (depth 500mm) / up to 4000A (depth 1000mm)</td>
</tr>
<tr>
<td>Degree of protection (external)</td>
<td>IP4x IP41 IP42</td>
</tr>
<tr>
<td>Degree of protection (internal)</td>
<td>IP20</td>
</tr>
<tr>
<td>Form (internal separation)</td>
<td>4b</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-5°C + 40°C</td>
</tr>
<tr>
<td>Pollution degree</td>
<td>3</td>
</tr>
<tr>
<td>Access</td>
<td>front (depth 500mm) / front/rear (depth 1000mm)</td>
</tr>
<tr>
<td>Dimensions of the sections</td>
<td>500mm / 1000mm</td>
</tr>
<tr>
<td>depth</td>
<td>2.300mm</td>
</tr>
<tr>
<td>height</td>
<td>900mm</td>
</tr>
<tr>
<td>width</td>
<td>500mm / 1000mm</td>
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<tr>
<td>Dimensions of the sections combined (with fixed compartments)</td>
<td>500mm / 1000mm</td>
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<tr>
<td>depth</td>
<td>2.300mm</td>
</tr>
<tr>
<td>height</td>
<td>300-450-600-750-900-1200mm</td>
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### ELECTRICAL AND MECHANICAL DATA

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<td>• power circuits 1890-2500V</td>
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</tr>
<tr>
<td>Rated frequency</td>
<td>• 50-60 Hz</td>
</tr>
<tr>
<td>Rated short-time current (1s)</td>
<td>• up to 70kA</td>
</tr>
<tr>
<td>Rated peak withstand current</td>
<td>• up to 154kA</td>
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<tr>
<td>Horizontal busbar rating</td>
<td>• up to 800-1600A (depth 500mm)/up to 4000 (depth 1000mm)</td>
</tr>
<tr>
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<td>Form (internal separation)</td>
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<tr>
<td>Ambient temperature</td>
<td>• -5°C + 40°C</td>
</tr>
<tr>
<td>Pollution degree</td>
<td>• 3</td>
</tr>
<tr>
<td>Access</td>
<td>• front (depth 500mm) / front/rear (depth 1000mm)</td>
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<tr>
<td>Dimensions of the sections (with withdrawable drawers)</td>
<td>depth = 500mm / 1000mm</td>
</tr>
<tr>
<td></td>
<td>height = 2300mm</td>
</tr>
<tr>
<td></td>
<td>width = 900mm</td>
</tr>
<tr>
<td>Dimensions of the sections combined (with fixed compartments)</td>
<td>depth = 500mm / 1000mm</td>
</tr>
<tr>
<td></td>
<td>height = 2300mm</td>
</tr>
<tr>
<td></td>
<td>width = 300-450-600-750-900-1200mm</td>
</tr>
</tbody>
</table>
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.
**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.

**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.

**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).
**ELECTRICAL AND MECHANICAL DATA**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
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<tbody>
<tr>
<td>Rated operational voltage</td>
<td>up to 690 V</td>
</tr>
<tr>
<td>Rated insulation voltage</td>
<td>up to 1000 V</td>
</tr>
<tr>
<td>Rated impulse voltage</td>
<td>8kV</td>
</tr>
<tr>
<td>Test voltage at 50-60Hz (5s)</td>
<td>power circuits 1890-2500V</td>
</tr>
<tr>
<td></td>
<td>auxiliary circuits 1500-2000V</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>50-60 Hz</td>
</tr>
<tr>
<td>Rated short-time current (1s)</td>
<td>up to 70kA</td>
</tr>
<tr>
<td>Rated peak withstand current</td>
<td>up to 154kA</td>
</tr>
<tr>
<td>Horizontal busbar rating</td>
<td>up to 1,600A</td>
</tr>
<tr>
<td>Degree of protection (external)</td>
<td>IP4x IP41 IP42</td>
</tr>
<tr>
<td>Degree of protection (internal)</td>
<td>IP20</td>
</tr>
<tr>
<td>Form (internal separation)</td>
<td>2a, 2b, 3a, 3b, 4a, 4b</td>
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<tr>
<td>Ambient temperature</td>
<td>-5°C + 40°C</td>
</tr>
<tr>
<td>Pollution degree</td>
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</tr>
<tr>
<td>Access</td>
<td>front/rear or front only</td>
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<tr>
<td>Dimensions of the sections</td>
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<td>depth</td>
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<tr>
<td>height</td>
<td>2,300mm</td>
</tr>
<tr>
<td>width</td>
<td>300-450-600-750-900-1,200mm</td>
</tr>
</tbody>
</table>

**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.
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

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
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<tbody>
<tr>
<td>Rated operational voltage</td>
<td>up to 690 V</td>
</tr>
<tr>
<td>Rated insulation voltage</td>
<td>up to 1000V</td>
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</tr>
<tr>
<td>Test voltage at 50-60Hz (5s)</td>
<td>power circuits 1890-2500V</td>
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<td>auxiliary circuits 1500-2000V</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>50-60 Hz</td>
</tr>
<tr>
<td>Rated short-time current (1s)</td>
<td>up to 70kA</td>
</tr>
<tr>
<td>Rated peak withstand current</td>
<td>up to 154kA</td>
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<tr>
<td>Horizontal busbar rating</td>
<td>630-800-1.600A (depth 500/800mm)/</td>
</tr>
<tr>
<td></td>
<td>up to 4.000A (depth 1.000mm)</td>
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<tr>
<td>Degree of protection (external)</td>
<td>IP4x IP41 IP42</td>
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<tr>
<td>Degree of protection (internal)</td>
<td>IP20</td>
</tr>
<tr>
<td>Form (internal separation)</td>
<td>3b</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-5°C + 40°C</td>
</tr>
<tr>
<td>Pollution degree</td>
<td>3</td>
</tr>
<tr>
<td>Access</td>
<td>front (depth 500/800mm) / front/rear (depth 1.000mm)</td>
</tr>
<tr>
<td>Dimensions of the sections (with removable drawers)</td>
<td>depth 500mm / 800mm / 1.000mm</td>
</tr>
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<td></td>
<td>height 2.100mm / 2.300mm</td>
</tr>
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<td></td>
<td>width 750mm</td>
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<tr>
<td>Dimensions of the sections combined (with fixed compartments)</td>
<td>depth 500mm / 800mm / 1.000mm</td>
</tr>
<tr>
<td></td>
<td>height 2.100 / 2.300mm</td>
</tr>
<tr>
<td></td>
<td>width 300-450-600-750-900-1.200mm</td>
</tr>
</tbody>
</table>
The MULTISYSTEM MS-D switchboard has a service index IS223. Advantages of the IS223 service index:
- Individual management of the functional units.
- Modifications to the drawers with the switchboard powered.
- Addition of drawers with the switchboard powered.
- Equipment inspectable in connected position.
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 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.
DISTRIBUTION AND MOTOR CONTROL
SWITCHBOARDS WITH REMOVABLE DRAWERS

MULTISYSTEM TQM
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
The MULTISYSTEM MS-WP switchboards are destined to change the conception of the electric switchboard for LV power distribution. The new MULTISYSTEM MS-WP takes advantage of TQM Multisystem’s thirty years of experience in the technology of withdrawable drawers applied to power center switchboards. In fact, MULTISYSTEM MS-WP is a switchboard in which the distribution circuit breakers up to 630A are housed in withdrawable drawers with mobility index of WWW, enabling the installer to add or modify the configuration of the switchboard at any time and without taking it out of service, as would be necessary for conventional power center switchboards. Fixed compartments will be used for outgoing lines above 630A. For users up to 630A, all the control, operation, protection and signalling equipment combined with the user to be powered are contained inside the drawer. In this way, the subsequent addition of a user to a switchboard in operation can take place in an extremely limited time (just a few minutes) and without taking the switchboard out of service. The installer just has to make the external connection of the cables.
POWER CENTER SWITCHBOARDS WITH WITHDRAWABLE DRAWERS

The MULTISYSTEM MS-WP switchboard allows the bank mounting of:
- combinations of motor starters
- moulded-case circuit breakers up to 630A

The modular concept enables modifications of the initial configuration of the drawers even when the switchboard is powered, by simply removing the drawer and re-positioning it.

- access to the connection zones of the power cables is from the back
- access to the connection zones of the auxiliary cables from the back or the front
- arrival of cables can be from below (switchboards with depth 1000mm) or above (switchboards with depth 1300).

The MS-WP switchboards can be combined with any other type from the MULTISYSTEM line [e.g. there can be MS-WP columns combined with MS-D, MS-MCCS, MS-MCCH columns, etc.].

### ELECTRICAL AND MECHANICAL DATA

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
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<tbody>
<tr>
<td>Rated operational voltage</td>
<td>up to 690 V</td>
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<tr>
<td>Rated insulation voltage</td>
<td>up to 1000V</td>
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<tr>
<td>Rated impulse voltage</td>
<td>8kV</td>
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<tr>
<td>Test voltage at 50-60Hz (5s)</td>
<td>power circuits 1890-2500V</td>
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<tr>
<td></td>
<td>auxiliary circuits 1500-2000V</td>
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<tr>
<td>Rated frequency</td>
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<td>Rated short-time current (1s)</td>
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<td>Rated peak withstand current</td>
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<td>Horizontal busbar rating</td>
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<td>Pollution degree</td>
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<td>Dimensions of the sections (withdrawable drawers)</td>
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<tr>
<td>width</td>
<td>900mm</td>
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<tr>
<td>Dimensions of the sections combined (with fixed compartments)</td>
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<td>depth</td>
<td>1.000mm / 1.300mm</td>
</tr>
<tr>
<td>height</td>
<td>2.300mm</td>
</tr>
<tr>
<td>width</td>
<td>300-450-600-750-900-1.200mm</td>
</tr>
</tbody>
</table>

In the withdrawable drawers, the incoming pliers (250A or 630A) and the outgoing pliers (from 250A up to 630A) are always generously sized with respect to the rated currents they have to withstand. The withdrawable drawers include the test position as standard: in this way, even for motorised circuit breakers, the functionality of the circuit breaker and of the auxiliary equipment combined with it can be checked. On the front of each drawer there is a plastic door where the control and signalling equipment is positioned, along with any measurement or protection instruments: this door can be opened with the user in operation for inspection purposes or for a thermographic check.

The arrangement of the withdrawable drawers on the columns of the MULTISYSTEM MS-WP switchboards can be varied at any time without cutting power to the switchboard.
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 closure panels of the sections (side and rear), as well as the front parts of the drawes, are made of hot rolled and painted sheet steel.

The base section contains the power equipment and the busbar systems (main system, distribution system, and protection conductors PE). The base section is subdivided into 4 zones separated by diaphragms in metal or in insulating material:
- main busbar zone
- distribution busbar zone
- equipment zone (withdrawable drawers or fixed cells)
- auxiliary zone

The minimum form of separation of the MULTISYSTEM MS-WP switchboard is 3b. The internal degree of protection IP2X is ensured with the drawers in all the positions (test, disconnected, extracted).

The equipment zone forms the main part of a base section. The useful height is divided into 18 modules of 100mm each. The withdrawable drawers are proposed in two sizes:
- drawer module 2 (height 200mm): is used for line start up to 250 A
- drawer module 3 (height 300mm): is used for line start up to 630 A

For the creation of withdrawable drawers for motor start, the same drawers are used (module 2 or module 3) depending on the equipment installed inside. In addition to the withdrawable drawers, on the MS-WP columns it is possible to fit fixed cells, each with its own door.

The MULTISYSTEM MS-WP switchboard has a service index of IS333. Advantages of the IS333 service index:
- Individual management of the functional units.
- Modifications to the drawers with the switchboard powered.
- Addition of drawers with the switchboard powered.
- Equipment inspectable in connected position.
- Test function for checking operation.
Main distribution 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 and from the back. This system distributes current to the various sections that make up the electric switchboard. All the sections can receive the same horizontal busbars. The busbars have a rated current up to 4,000 A.

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).

Secondary distribution busbar compartment
The secondary 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 the current to the withdrawable drawers or to the fixed cells of one section. The rear separation of the busbars is made with modular metal diaphragms with air vents. The profile of the busbars is designed to enable direct insertion of the pliers of the withdrawable drawers. The busbars have a rated current of 2,100 A or 1,250 A (other rated currents on request). The vertical busbars are, as standard, in silver-plated copper.

Composition of the withdrawable drawers
The withdrawable drawers have a mobility index of WWW. All the control, protection, and signalling equipment combined with the user to be powered are contained in 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 vertical modularity of the drawers is 100 mm:
- drawer 2 modules : 200mm
- drawer 3 modules : 300mm

Each drawer is composed of:
- frame in galvanised sheet steel
- power pliers upstream (3 or 4 poles) with standard rated currents of 250A, 400A, 630A.
- power pliers downstream [3 or 4 poles] with standard rated currents of 250A, 630A.
- lateral auxiliary pliers with 26 auxiliary terminals
- 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 panel on the front of the drawer in thermoplastic material, for installing the control, signalling, measurement, or protection equipment
- internal mounting plate for the power equipment
- internal DIN rails for auxiliary equipment
- internal safety lever (fall prevention)
- two ergonomic handles for drawer movement
- mechanical indication of the position of the drawer on the front (connected, test, disconnected)
- red mechanical pushbutton for the consent for drawer movement

Incoming pliers
The power pliers upstream from the withdrawable drawers engage on the rear busbar system by means of grills for protecting the busbars that are red in colour and have IP2X degree of protection. The pliers can be 3- or 4-pole with standard rated currents of 250A, 400A, 630A. The connected contacts are silver-plated.

Outgoing pliers
The power pliers downstream from the withdrawable drawers engage on shaped elements in bare copper which, in turn, receive the power cables incoming to the switchboard in the part that protrudes in the rear cable zone. The pliers can be 3- or 4-pole with standard rated currents of 250A and 630A. The connected contacts are silver-plated.

Auxiliary pliers
Each auxiliary piers has 26 terminals and is mounted on a support system that makes it possible to have:
- with drawer in the connected position (power pliers upstream and downstream connected): auxiliary pliers connected
- with drawer in test position: the power pliers (upstream and downstream) are disconnected, while the auxiliary pliers remain connected; in this way, the auxiliary circuits are active and the operation of the drawer can be tested with the power deactivated.
- with drawer in disconnected position (power pliers upstream and downstream disconnected): auxiliary pliers disconnected

Note: In the disconnected position, the drawer is still mounted on the switchboard, advanced by a few centimetres with respect to the test position, but is completely deactivated. From this position it is possible to proceed to the complete withdrawal of the drawer using the internal safety lever (fall prevention).
• 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.

These panels are provided 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 withdrawable drawers

The drawer manoeuvres are 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). The mechanical pushbutton for the consent for drawer movement can also be locked with padlocks (up to 3 padlocks). With the drawer completely removed, the degree of protection is IP2X.

• Drawer movement (for circuit-breakers with extended rotary handle)

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
- press and hold the red mechanical pushbutton for the consent for movement
- push the drawer all the way in: the upstream power connection pliers will insert on shaped elements in copper for connection to the external cables, the moving part of the auxiliary pliers will insert on its fixed part.
- the mechanical position signal will go to RED (CONNECTED)

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

Procedure for withdrawing a drawer:

a) from the connected position to the test position
- open the circuit breaker or switch-disconnector (with the extended rotary handle)
- press and hold the red mechanical pushbutton for the consent for movement
- pull the drawer out until it reaches the test position
- the mechanical position signal will go to YELLOW (TEST)
- release the red mechanical pushbutton for the consent for movement

b) from the test position to the disconnected position
- press and hold the red mechanical pushbutton for the consent for movement
- pull the drawer out until it reaches the disconnected position
- the mechanical position signal will go to GREEN (DISCONNECTED)
- release the red mechanical pushbutton for the consent for movement

c) removing the drawer
- press and hold the red mechanical pushbutton for the consent for movement
- pull the drawer out until it is stopped by the safety locking mechanism (fall prevention)
- release the red mechanical pushbutton for the consent for movement
- lift the internal lever of the fall prevention mechanism
- the drawer can now be removed

The estimated time for a complete removal of the drawer, from the connected position to the removal, is less than 10 seconds.

• Moving the drawers (for circuit-breakers with motor mechanism)

The circuit-breakers with motor mechanism cannot fit an extended rotary handle. In order to insert or withdraw a drawer with the guarantee that the circuit-breaker is open, TQM Multisystem has created an opening mechanism that acts on the original manufacturer circuit-breaker safety trip interlocks. A dedicated lever situated on the front of the drawer, under the front panel of the circuit-breaker motor mechanism, activates the original safety trip interlock, which in turn automatically opens the circuit-breaker or, in the opposite position, allows its closure.

This mechanism, in turn, is interlocked with the red mechanical pushbutton for the consent for movement of the drawer.

The operations of drawer insertion or withdrawal are similar to those for the circuit-breakers with extended rotary handle, with the only difference that, instead of operating on the extended rotary handle of the circuit-breaker, it works with the lever of the opening mechanism of the circuit-breaker with motor mechanism described above.
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.

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### ELECTRICAL AND MECHANICAL DATA

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated operational voltage</td>
<td>up to 690 V</td>
</tr>
<tr>
<td>Rated insulation voltage</td>
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<tr>
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<td>50-60 Hz</td>
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<tr>
<td>Rated short-time current (1s)</td>
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</tr>
<tr>
<td>Rated peak withstand current</td>
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</tr>
<tr>
<td>Horizontal busbar rating</td>
<td>up to 1.600A</td>
</tr>
<tr>
<td>Degree of protection (external)</td>
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<td>Degree of protection (internal)</td>
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<td>Form (internal separation)</td>
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<td>Access</td>
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<tr>
<td>Dimensions of the sections</td>
<td>depth 500mm, height 2.300mm, width 300-450-600-750-900-1.200mm</td>
</tr>
</tbody>
</table>
• 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.
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.

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</table>
• 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.
**POWER CENTER SWITCHBOARDS**

**MULTISYSTEM TQM**

**MS-PC 3**

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**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.

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**ELECTRICAL AND MECHANICAL DATA**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated operational voltage</td>
<td>up to 690 V</td>
</tr>
<tr>
<td>Rated insulation voltage</td>
<td>up to 1000V</td>
</tr>
<tr>
<td>Rated impulse voltage</td>
<td>8kV</td>
</tr>
<tr>
<td>Test voltage at 50-60Hz (5s)</td>
<td>power circuits 1890-2500V</td>
</tr>
<tr>
<td></td>
<td>auxiliary circuits 1500-2000V</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>50-60 Hz</td>
</tr>
<tr>
<td>Rated short-time current (1s)</td>
<td>up to 80kA</td>
</tr>
<tr>
<td>Rated peak withstand current</td>
<td>up to 176kA</td>
</tr>
<tr>
<td>Horizontal busbar rating</td>
<td>up to 4.000A</td>
</tr>
<tr>
<td>Degree of protection (external)</td>
<td>IP4x IP41 IP42</td>
</tr>
<tr>
<td>Degree of protection (internal)</td>
<td>IP20</td>
</tr>
<tr>
<td>Form (internal separation)</td>
<td>2a, 2b, 3a, 3b, 4a, 4b</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-5°C + 40°C</td>
</tr>
<tr>
<td>Pollution degree</td>
<td>3</td>
</tr>
<tr>
<td>Access</td>
<td>front/rear</td>
</tr>
<tr>
<td>Dimensions of the sections</td>
<td>depth 1.500mm</td>
</tr>
<tr>
<td></td>
<td>height 2.300mm</td>
</tr>
<tr>
<td></td>
<td>width 300-450-600-750-900-1,200mm</td>
</tr>
</tbody>
</table>
• 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.
**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.

**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
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)
Each switchboard built by TQM 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.)

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.
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 TQM 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 respondence 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 TQM 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.
SERVICE INDEX (SI)
AN INSTRUMENT FOR CHOOSING THE TYPE OF LOW VOLTAGE ELECTRIC SWITCHBOARD ON THE FRENCH MARKET

What is the Service Index (SI)?

Used for a long time on the French market, the Service Index (SI) was conceived to determine in a simple and precise way the type of distribution or motor control switchboard that responds to the requirements of the plant and of the customer.

The Service Index (SI) is an instrument that allows each user or each specifier to characterise the requirements to which the low voltage electric switchboard must respond in terms of the work to be carried out on it in relation to the operating controls, maintenance, and evolution.

The objective of the Service Index is to qualify the level of service provided by any type of low voltage switchboard and to deal with all the types of servicing in the various periods of its lifetime.

There are three reasons for specifying a Service Index (SI) for a low voltage switchboard:

— Each SI corresponds to a concept of functional unit (FU) of the switchboard (fixed, removable, withdrawable unit).
— Each type of functional unit (FU) of the switchboard (fixed, removable, withdrawable unit) corresponds to a technical-economic need, a level of authorisation of the maintenance personnel, a level and a maximum servicing time in case of a fault or modification of the installations.
— The choice of a high SI corresponds to a precise design aspect as regards the need for continuity of service and the operational safety of the switchboard.
The composition of the Service Index (SI)

The Service Index is composed of three fields, each with numbering that can go from 1 to 3.

1. The first field refers to the control in **OPERATION**
2. The second field refers to **MAINTENANCE**
3. The third field refers to the **EVOLUTION** of the switchboard.

**Operation** means the status in which the switchboard is in operation and it may be necessary to work on it or parts of it to verify equipment, take measurements, make adjustments, etc.

**Maintenance** means the status in which the switchboard undergoes servicing to restore the original conditions (in whole or in part).

**Evolution** refers to each intervention aimed at modifying the switchboard or adding functional units to the switchboard.

The table to the right summarises the criteria for choosing the Service Index (SI).

The service continuity increases with the value of each number, and it is important to note that each number is independent from the other. The minimum index is 111 (referring, for example, to switchboards with fixed compartments with fixed equipment), requiring cutting off power and disconnections for manual adjustment operations.

The maximum index is 333, which regards in particular the withdrawable drawers for motor start or distribution with mobility index WWW and test condition.

With the switchboards of the MULTISYSTEM line, the Service Index can be assigned to each functional unit.

With the mix of units, the choice can be made for each application in order to optimise and to reduce investments to that which is strictly necessary.

<table>
<thead>
<tr>
<th>Setting/Checking</th>
<th>Maintenance/Repairing</th>
<th>Evolution/Additions/Modifications/Expansions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td><strong>1</strong></td>
<td><strong>2</strong></td>
</tr>
<tr>
<td>Shutting down the whole switchboard.</td>
<td>Shutting down the whole switchboard.</td>
<td>Shutting down the whole switchboard.</td>
</tr>
<tr>
<td>I would like this operation to shut down only the FU concerned (power and auxiliary).</td>
<td>I would like the maintenance operation to be limited to the FU concerned (power and auxiliary). The connections will have to be disconnected and reconnected when it is replaced.</td>
<td>Addition of a FU (power and auxiliary) in pre-equipped spare slots.</td>
</tr>
<tr>
<td><strong>2</strong></td>
<td><strong>2</strong></td>
<td><strong>3</strong></td>
</tr>
<tr>
<td>I would like this operation to shut down only the power to the FU concerned (power and auxiliary), but allow the automated control system tests, which make it possible to test the installation in its entirety before putting it back into service, to be performed.</td>
<td>I would like the maintenance operation to be limited to FU concerned (power and auxiliary). It should be replaced without disturbing with the connections.</td>
<td>I would like to be able to add any type of a FU (power and auxiliary), motor control or protection, without powering down the switchboard. This should be done in a location without equipment, within the limits stipulated by the manufacturer.</td>
</tr>
</tbody>
</table>
STANDARDISED LOW VOLTAGE ELECTRIC SWITCHBOARDS
WITH MODULAR ELEMENTS