

SMBE

FE Fuji Electric
Innovating Energy Technology

Which switchboards equip your building facilities for the future?



From factories to shopping centres, from data centres to high-rise buildings, flexible switchboards are vital to adapting buildings to future needs

As building uses change more often – keeping pace with the rapid change in business needs and business types occupying them – building owners and facility managers must focus on how best to equip their asset to respond flexibly to future needs.

One of the installations at the core of change is a building's low voltage switchgear installation, which distributes, meters, measures and adjusts energy flow to the power needs of highly diverse functions. Such functions extend from lighting, heating, HVAC, lifts and standard building services, right through to mission-critical functions - such as data centres, telecommunications, retail accounting services, industrial and scientific processing and health and emergency services. Good low-voltage switchboard design is also critical to control of services that ensure high Green Star environmental ratings.

Increasingly, such diverse needs are being met by modular switchboards, which are designed to change with business needs and building uses. But there are different schools of thought about whether modular installations should be welded or bolted for optimum durability and adaptability to change.

"Not many engineers and end users have the opportunity to examine and compare the large number of different modular systems and welded constructions that are available in the market today. To make this comparison harder, the technical differences between the different modular systems alone are profound," says Fuji SMBE Macquarie, a wholly owned subsidiary of Fuji Electric. Fuji SMBE Macquarie produces the latest, third generation of iNTELECT switchboards in Australia, extending an iNTELECT product line of which tens of thousands have been manufactured in Australia, giving reliable service in data centres, banks, schools, hospitals, power stations, shopping centres, mines and factories. Different versions of the iNTELECT range have been sold in over 23 countries.

"As one of Australia's largest LV switchboard manufacturers, we manufacture and assemble switchboards of both bolted modular construction and traditional welded construction."

"Occasionally we hear queries raised about the rigidity and strength of bolted construction compared to welded construction. This is a fair question, and one which we are well placed to address, because we build both, and thus have no vested interest to build one form of switchboard construction over another unless there are genuine benefits to do so."

"We also manufacture our own metalwork and conduct our own R&D on optimum outcomes, unlike many other Australian switchboard manufacturers. This equips us to know if or when traditional welded construction provides any advantage in either design or cost, in which case we will use it."

"Our iNTELECT Modular Switchboard System uses a combination of welded and bolted construction as standard because in nearly all cases it is the best product to suit the purpose. It is designed so that the number of welds is kept to a minimum for reasons that include:

- Welded joints are not actually stronger than bolted joints. They can provide a seismic weak point as welds can crack over time due to vibration, whereas a bolted joint will not. We have seen older welded switchboards with this problem, and once the welds have cracked, then it is very difficult to remedy in a switchboard that is in service.
- Bolted or screwed joints in the structure are made using torque-controlled power tools that give repetitive quality control, with every connection being the same. The same level of repetitive quality control is difficult to achieve with welded switchboards, as welding is different and subject to the skill of the person making the weld, even if that person is a highly skilled tradesman.
- It is difficult to ensure that welds are spaced in exactly the same place to ensure repetitive accuracy. This too is up to the discretion of the person doing the welding. This makes it very difficult to ensure verification of the final construction with the type tested prototypes, especially where arcing fault containment is a consideration.
- Welded construction extends the manufacturing time, as it adds another process to the manufacture of the switchboard. It also prevents some of the assembly tasks being done concurrently.
- There is a misconception that extra rigidity is imparted to the switchboard construction if the sheet metal joints are welded. This is not the case. Structural strength is derived from the way the formed sections support each other.

- As a design flexibility example, iNTELECT is designed so that the alterations can be quickly made with minimum downtime. We live in an age where continuity of electrical supply is of vital importance. For example, it is possible to reconfigure a 630A MCCB compartment as 2 x 250A MCCB's in a two-hour shutdown window using our standard construction. If welded construction is used, the same change will take longer than eight hours.

This is because the shelves, mounting pans and brackets all have to be removed using angle grinders to break the welds. The merit in the decision to use designs such as the modular iNTELECT may be seen within five years of delivery, as the use of the building changes over time and changes need to be made.

- We are occasionally reminded of the fact that some other modular systems have to be lifted and handled carefully because of their fragility. This is not the case with designs such as the iNTELECT G3, which has the structural strength to be lifted from either the base or via eyebolts in the roof.
- It is a requirement of IEC-61439.1 & AS/NZS-3439.1 that all metal parts of the switchboard are securely bonded to the earth bar. The multiple bolted and screwed connections used to interconnect the metalwork give multiple earth paths to achieve earthing. Because all bolted joints are the same and machine-tightened, the joints all earthed joints can be relied upon to be the same. This cannot always be said of welded connections, because the number of welds, their position and the degree of weld penetration, are at the complete discretion of the welder.

"There is broad discussion in the engineering community about bolted V welded fabrication. This discussion is by no means confined to switchboard manufacture. It ranges over a broad range of mission-critical technology, ranging from welded v bolted construction of giant water tanks through to plant and pipelines encountered in the oil, gas, energy and minerals processing industries, where secure, evenly torque joints are vital to the safety of surface and sub-surface infrastructure."

"Often in these diverse technologies and fabrications there is no one answer for every application. Users have to determine what is best for their particular application - and it pays to do your homework."

"In the case of switchboards, we recommend a visit to your manufacturers' plants, armed with a list of questions. We certainly welcome such visits to our production facilities. This is the best way for all stakeholders to evaluate designs such as the iNTELECT Switchboard System and derive some knowledge and comfort as to the robustness and suitability of a particular design for their conditions."

Background: iNTELECT G3

The iNTELECT G3 Switchboard System is a custom-modular switchboard system that has been the subject of ongoing continuous development for more than 30 years.



iNTELECT™G3 switchboard casing and busbar system

Every year the product undergoes design reviews based on our experience of the year's events, changing regulatory requirements and improvements in manufacturing materials and techniques. It has evolved from its initial form as a

traditional folded and welded construction to the point where it does not have any welded parts unless they are required for structural strength; nor any additional bolted connections in the assembly where they are not needed.

Sometimes the iNTELECT G3 Switchboard System is viewed in the same light as modular switchboard systems elsewhere in the world when it clearly not the same. iNTELECT G3 is the subject of several Registered Designs and Patents, and has been awarded with an Australia Design Mark for Australian design excellence. iNTELECT is the bridge between the traditional hand-made switchboards of 40 years ago where no two parts were the same and the mass-produced IEC style modular switchboards where customisation is not possible.

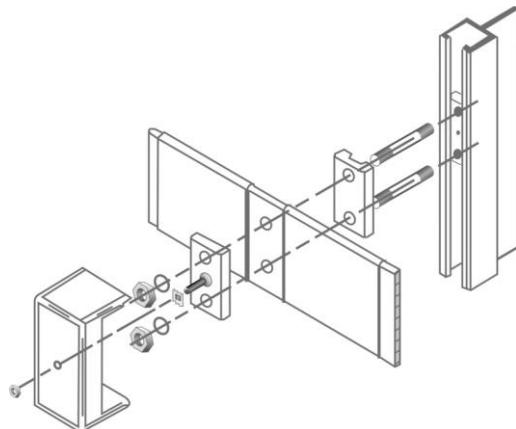
This new generation of the proven and versatile iNTELECT™ modular switchboard system features the strength of custom-built configurations with the flexibility of modular construction.

This latest design progression of the iNTELECT™ system is the most robust and versatile iNTELECT™ switchboard yet, benefitting from 30 years of continuous R&D into the one product, to produce the most effective design and multipurpose functionality available for low-voltage switchboards and motor control centres.

"The G3 system integrates SMB Harwal and SMB Macquarie's extensive manufacturing and product testing experience, with valuable customer input accumulated over many years of Australian market leadership."

Features of iNTELECT G3 system include:

- **Adaptability to the world's best brands of switchgear for different applications.** Fuji SMBE Macquarie can use the most appropriate switchgear for the designated purpose, unlike some switchboards that have been developed by switchgear suppliers as a vehicle to sell circuit breakers. iNTELECT™ is a complete system engineered by specialist switchboard manufacturers that can be custom engineered to suit the customer's individual requirements.



- **Safety and versatility.** The iNTELECT™ busbar system is arranged in a patented matrix (or grid) pattern in which the main busbars occupy a range of predetermined vertical and horizontal positions arranged for maximum mechanical strength and cooling, with phases fully insulated and segregated from each other. This results in a compact, safe switchboard.
- **Outstanding strength.** The modular system is engineered for outstanding strength, with the frame being sufficiently strong to be lifted from the top (rather than the bottom, as with most systems) adding to ease of installation and maintenance. Access is further enhanced by a unique stainless steel 180-degree door hinge with continuous polyurethane door seals, machine-applied for maximum protection and long-life.



Frame, gasket and corner joints – engineered for strength and reliability

- **Compact flexibility for alteration, expansion and maintenance.** The busbar system takes minimal depth within the switchboard yet offers maximum flexibility in switchboard design without departing from type

test certification. Busbar connections can be readily accessed for maintenance and system expansion.

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