

The CLIPSAL logo features a stylized icon of three vertical bars in red, purple, and blue to the left of the brand name "CLIPSAL" in a bold, white, sans-serif font with a registered trademark symbol.

CLIPSAL[®]

by Schneider Electric

The word "INFINITY" is written in a large, bold, black, sans-serif font with a white glow effect, set against a background of diagonal light streaks.

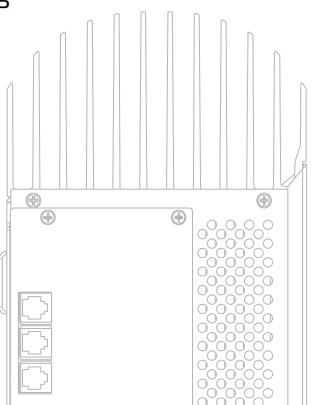
INFINITY

Professional

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ABOUT CLIPSAL

Clipsal® was founded in Adelaide, South Australia in 1920, based on a range of adjustable conduit fittings. Almost 90 years on, Clipsal is one of the leading producers of electrical products in its field.

In the early 1990's Clipsal began development in commercial lighting control products. This led to the formation of Clipsal Integrated Systems, specialising in the development and manufacture of electronic lighting and building automation products under the C-Bus® brand. Clipsal Integrated Systems has since grown rapidly and C-Bus has gained widespread acceptance in major commercial markets around the world.

Clipsal Integrated Systems

Clipsal Integrated Systems first released the C-Bus Energy Management and Control System back in 1994. Since then C-Bus has become the "benchmark" of Clipsal Integrated Systems' product range. C-Bus was designed and manufactured for commercial applications and it is in this marketplace that the technology comes into its own. Due to increasing worldwide interest, the C-Bus DIN Rail series and a wide selection of sensors and detectors were also added to complement the range.

With the continued development of C-Bus for commercial applications, a new generation of products were born, including black and white, and colour touch screens, Neo® and Saturn™ ranges of C-Bus wall switches, as well as an extensive range of other complementary products including DALI gateways, Schedule Plus and Citect Facilities SCADA solutions.

Worldwide Lighting Control Solutions

Clipsal C-Bus has a long history of successful installations for commercial buildings, providing the lighting control solutions for worldwide iconic structures, from The Sydney Opera House, 10 Downing Street and Stadium Australia to The McLaren Formula 1 Technology Centre UK, NRMA House Sydney and Cisco Bangalore, for example.

Our vast experience enables us to provide a complete electrical solution for any commercial space, from the most exclusive boardroom to a completely integrated office environment.

Fully Backwards Compatible

As a company, Clipsal believes in continuous product improvement and evolution to meet the needs of its commercial customers. However, as our products evolve, we understand that backwards compatibility is also a very essential requirement for our customers. That is why Clipsal C-Bus systems are second-to-none, as they continue to develop, yet always remain fully compatible with existing products and ranges. Thus, ensuring the investment of our customers now and long into the future.

Clipsal's strength is further enhanced and our hardware and software solutions expanded by the relationship with our parent, Schneider Electric – a world leader in power and control solutions.



PROFESSIONAL HIGH POWERED DIMMERS

Clipsal's latest addition to the C-Bus portfolio is the comprehensive range of innovative Professional high powered dimmers. These purpose designed, commercial products are the perfect platform upon which to build a lighting control strategy, offering a user-friendly range of dimmers that provide unrivalled flexibility, integration and energy management.

Their innovative design also presents a wide range of features and benefits, including easier creation, management, use and maintenance of complex lighting control systems.

Fully Integrated with C-Bus

Clipsal C-Bus Professional high powered dimmers fully integrate into Clipsal's C-Bus automation system, providing access to the world leading range of switches, touch screens, sensors and other wall devices. As part of Schneider Electric you can be confident that Clipsal can also provide for all your low voltage needs throughout the entire building. With a full suite of discrete electrical components available, as would be expected from market leaders such as Clipsal, APC, TAC, Citect, Pelco and all the other members of the Schneider Electric family.

The Professional high powered dimmers form part of a wider integrated approach to building lighting control, giving integration capabilities with building management systems, SCADA data acquisition solutions and numerous other third party devices and applications.

With the use of a Clipsal C-Bus OPC server or C-Bus BACnet gateway, integrating a new Clipsal C-Bus Professional high powered dimmer with an existing building management system is straightforward, providing greater flexibility of control and further opportunities for energy savings.

Ideal for the Most Demanding Environments

The dimmers are constructed to the highest standards, providing long term, robust and reliable service in the most demanding environments.

Designed without cooling fans or any other moving parts and having eliminated other high maintenance elements, the dimmers ensure the lowest cost of ownership and the quietest operation to suit the most stringent of requirements.

We recognise that it is not always possible at specification stage to be precise about the final load count or load size for all dimmed circuits. It is also very common for customer requirements to change once a building is handed over, with additional circuits being added or load types changing to suit the buildings actual use. This is why Clipsal have set out to simplify the whole process of selecting, installing and making additions to installed dimmers, with the modular design of the Professional high powered dimmers.

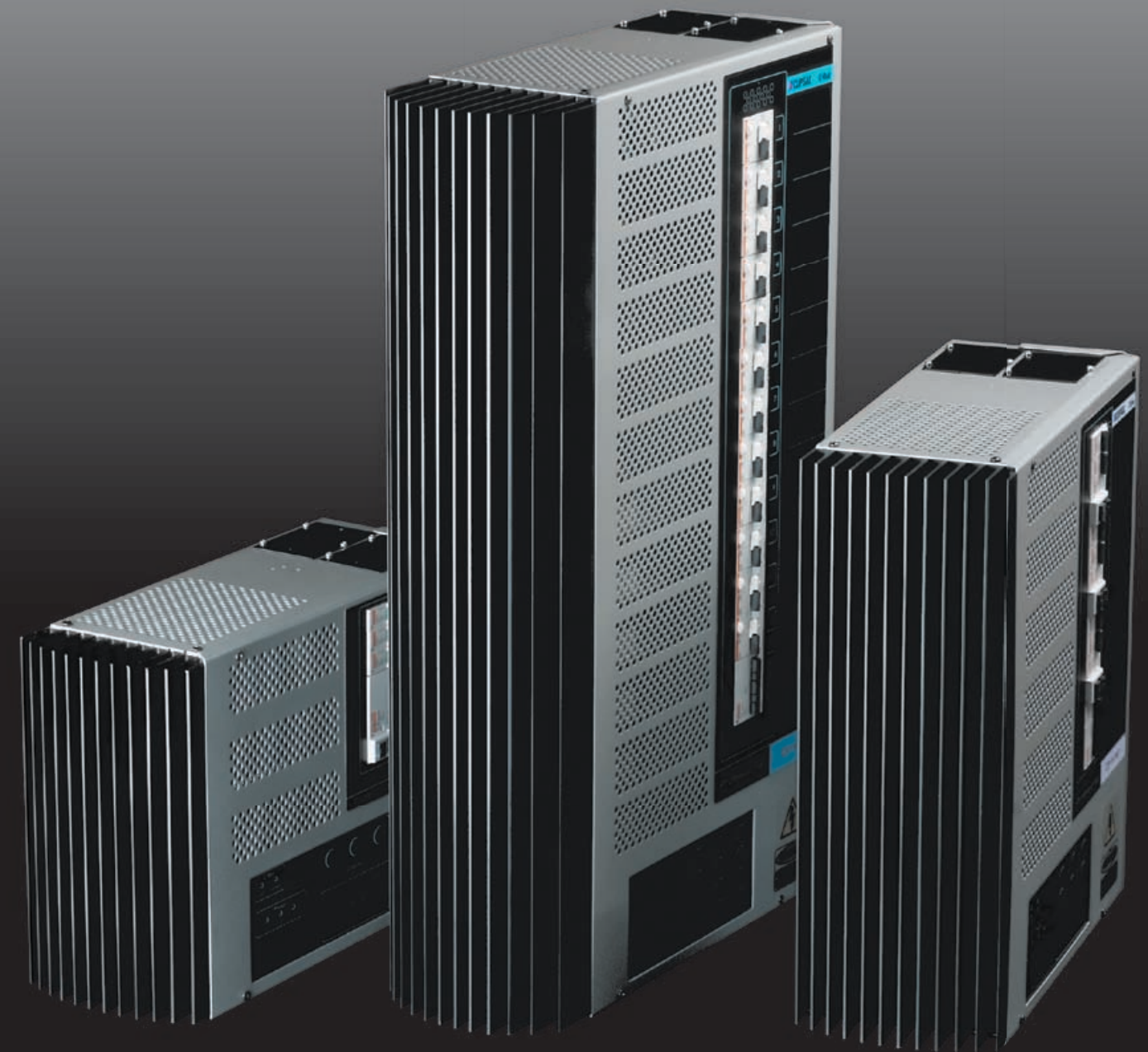
The modular design allows designers to add dimming channels to an existing Professional high powered dimmer, or change the channel card to suit an alternate load size.

The leading edge channel cards are provided in the following range of current ratings:

Leading Edge	RCD Option	3 Channels	6 Channels	12 Channels
20A	√	√	√	√
16A	√	X	X	√
10A	√	√	√	√
5A	√	√	√	√
3A	External	X	√	√

The Professional high powered dimmers are made in three ranges, defined by the number of channels they support and the overall rating for the supply to the unit.

Clipsal is clear that the needs of commercial spaces are under constant change, particularly in multi-tenanted buildings where the building owner is required to meet the needs of a constantly changing tenant population. Clipsal's Professional high powered dimmer flexibility is designed to minimise the cost impact of change on the building owner and reduce the entry cost for new tenants.



INNOVATIVE SOLUTIONS

Clipsal is focused on enhancing the use of its lighting control products, by supplying innovative solutions that benefit both customers and installers. Our goal is to ensure that all customers have access to market leading technology at cost effective prices. To do this Clipsal focuses on four key aspects when designing product for the commercial marketplace.

Flexibility

In this day and age commercial spaces, and the businesses that occupy them are constantly evolving and undergoing change. Therefore, in order to keep up, a buildings lighting system must offer convenience and above all flexibility. With Clipsal's C-Bus Control and Management System as a business evolves, so too can the system.

Control units like the Professional high powered dimmers are the latest products to enhance C-Bus flexibility by moving away from fixed configuration of channels. This flexible approach allows on site variation in channel rating and load quantity so the dimmer can adapt or change with the installation. Control groups can also be reprogrammed at any time to accommodate business changes such as the reallocation of floor space or extended trading hours.

Integration

Today in commercial buildings, customers demand integrated solutions. The benefits of integration range from reduced training costs and system overheads, to lower complexity and above all greater flexibility in total building system use.

Integrated systems cost less to design, install and most importantly operate.

C-Bus provides a transparent platform for integration in the commercial environment including: air conditioning, audio visual equipment, security and access control, automatic doors and motorised blinds or shutters. Clipsal has a wide range of integrated options for its own protocols and provides numerous industry standard options including OPC and BACnet.

User Friendliness

Clipsal C-Bus enabled dimming products like the new Professional high powered dimmer range, make it easy to integrate a wide variety of automation features, ultimately allowing customers to maximise the benefits and flexibility of their lighting solutions.

Requirements for varying light levels are often time or activity dependent, such as cleaners rosters, public holidays and after hours activities, or rotating the use of a space for breakfast, lunch, dinner or a dance venue. Taking all of these different elements into consideration Clipsal's Professional high powered dimmers provide flexible, easy to use controls in order to offer customers a convenient, safe and comfortable environment.

It is a given in business, that operational requirements change and often at short notice. Therefore a user-friendly control solution that customers can operate themselves and adjust to suit their individual needs is essential. That's why Clipsal's new C-Bus Professional Series is perfect, as it enables changes to occur quickly, efficiently and with little disruption to a businesses daily routine.

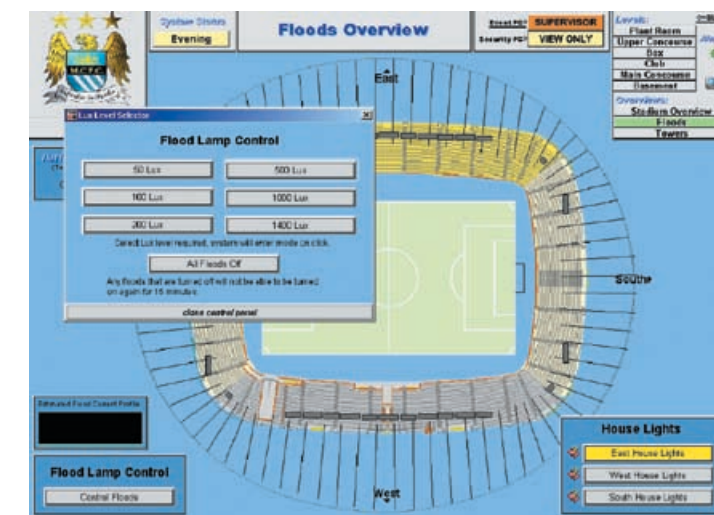
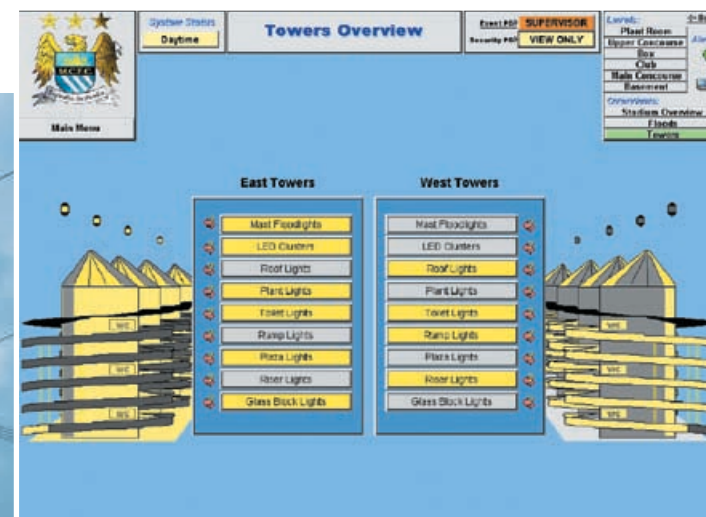
Energy Management

If you want to increase profit, one of the most straightforward ways to boost the bottom-line in any organisation is to reduce costs, and for everyone today one of the most significant costs is energy.

We live in an increasingly environmentally conscious society. More and more emphasis is being placed upon the need for energy management in commercial buildings. In many cases this is also the subject of government regulation.

If by more efficient use of energy in lighting applications, the cost to operate a facility can be reduced, but productivity maintained or even improved, then fundamentally the profit derived from its function increases. Obviously being energy efficient also has a huge beneficial impact on the environment, therefore saving money in this area of business also comes with the added bonus of feeling good about these actions.

Dimming technology is at the forefront for energy management and it is here that the new range of Professional high powered dimmers provides significant advantages to commercial customers. Aside from highly efficient dimming solutions, C-Bus also utilises many other technologies such as occupancy detectors, ambient light sensors, temperature control and variable lighting levels to maximise the efficiency of commercial environments.



ACCREDITATION

It is always important to know exactly what you are buying when choosing a product such as a high powered dimmer, especially when it comes to critical factors such as compliance and safety.

All electromechanical products manufactured today are required to be tested for several aspects of compliance, including:

- safety
- electromagnetic compatibility
 - emissions
 - immunity
- environmental considerations
 - use of hazardous substances in their manufacture.

Not all types of products have standards specific for their use, but in the electrical industry we are fortunate that this is not the case. In fact there are a range of standards created that specifically apply to lighting control products and dimmers in particular. These standards are defined by the IEC (International Electro-technical Commission) and then incorporated into use by local authorities with any modification required to suit the local market.

Clipsal takes its responsibility in this area very seriously and always has its products independently tested by specialist, third party accreditation laboratories, in order to meet standards specific to the product application.

Manufacturers can also choose to carry out their own testing without referral to any external body. Clipsal however, considers the external oversight valuable and worthwhile, therefore always opts to have each of its products independently tested and accredited.

Amongst the range of standards to test against, are generic standards, these are intended for use on products that do not have their own specific category. However, generic standards (as opposed to specific standards) tend to be less focused on the actual application, and in some cases are used by manufacturers to claim accreditation of lighting control and dimming products, even though specific standards do exist.

These standards introduce different testing requirements, for instance:

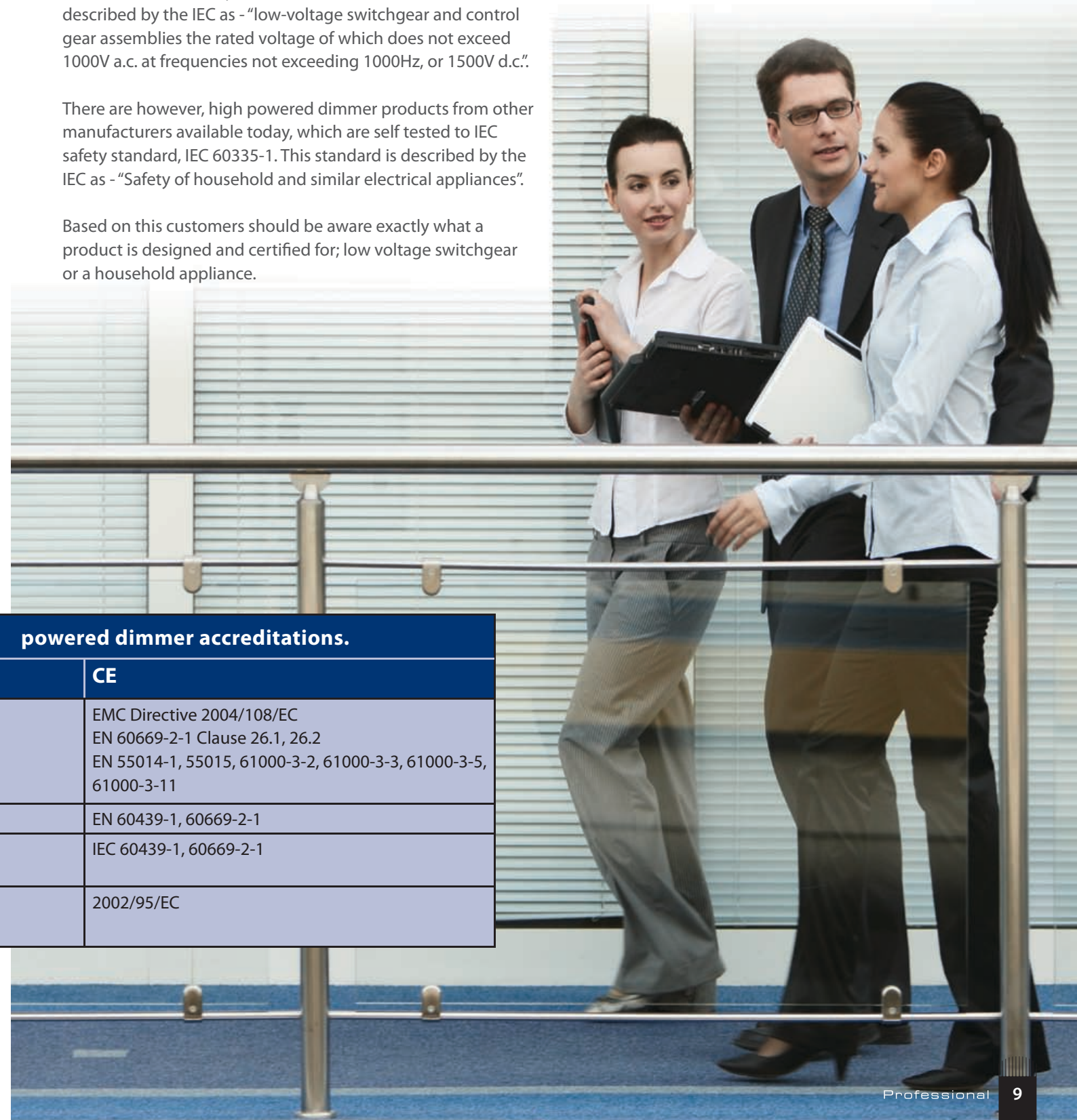
- Clipsal tests all of its dimmer products to standards specifically related to lighting equipment and dimming products.
- The specific electromagnetic testing defined for dimming products requires comprehensive testing of EMC performance at all dimming ranges under standard operating conditions.
- Other manufacturers have chosen to test and declare their dimmer products as "Energy Management Controllers" and test to generic standards only.
- Under the generic electromagnetic compatibility standard used by these manufacturers, a dimmers performance is only evaluated at 0% and 100% load. There is no requirement to establish the electromagnetic behaviour of the dimmer when performing its primary function of dimming loads.

"Safety is the most fundamental test"

Clipsal Professional high powered dimmers are independently tested to the IEC safety standard, IEC 60439-1. This standard is described by the IEC as - "low-voltage switchgear and control gear assemblies the rated voltage of which does not exceed 1000V a.c. at frequencies not exceeding 1000Hz, or 1500V d.c."

There are however, high powered dimmer products from other manufacturers available today, which are self tested to IEC safety standard, IEC 60335-1. This standard is described by the IEC as - "Safety of household and similar electrical appliances".

Based on this customers should be aware exactly what a product is designed and certified for; low voltage switchgear or a household appliance.



C-Bus Professional High powered dimmer accreditations.		
Accreditation	C-Tick	CE
EMC	AS/NZS CISPR14-1 CISPR15	EMC Directive 2004/108/EC EN 60669-2-1 Clause 26.1, 26.2 EN 55014-1, 55015, 61000-3-2, 61000-3-3, 61000-3-5, 61000-3-11
Low Voltage		EN 60439-1, 60669-2-1
Electrical Safety	AS/NZS 3439-1 IEC 60669-2-1	IEC 60439-1, 60669-2-1
ROHS (Reduction of Hazardous Substances)		2002/95/EC

STRONG, RELIABLE AND ROBUST

Lighting control products for commercial applications are increasingly required to handle a highly flexible space with constantly changing requirements.

Traditionally commercial high powered dimmers provided for fixed groups of dimmer loads in set numbers of channels. This fixed nature, however, does not suit a dynamic environment where mixed load quantities and sizes are required to be controlled from a single dimming source.

Single and three phase track lighting applications, as well as a comprehensive range of load types can all be configured from a single dimmer, including:

- incandescent lamps
- halogen lamps
- fan motors
- iron-core transformer based, low voltage lamps
- electronic transformer based, low voltage lamps
- high-reactance transformers for neon tube lighting.

Careful thermal design and the use of highly efficient heat sink designs, the removal of cooling fans, their associated filters and moving parts all further reduce maintenance requirements.

In a commercial project the time to commission and the ability to override normal operation are also factors to consider when selecting a high powered dimmer. If the control system is not available during commissioning, as is often the case early after installation, can the loads be controlled to provide for both testing and practical use of the space affected? Furthermore, should some unforeseen error or failure occur, it is important to be able to quickly and easily override the controls and even bypass the physical dimming circuits themselves. C-Bus Professional high powered dimmers provide multiple means to ensure connected loads can be controlled regardless of the availability of the overall control system.

Precise, Accurate and Smooth Dimming

Clipsal understands that commercial environments rely upon the provision of services controlled by these dimmers, to generate revenue. Therefore multiple means of ensuring the ability to bring on loads is an important factor. The C-Bus Professional high powered dimmers provide local C-Bus overrides as well as physical bypass switches per channel, ensuring that services can be maintained whenever possible.

Reliability and the ability to operate regardless of external influences are again important in a commercial space. The dimmer must be able to compensate for overloading without interruption. The C-Bus Professional high powered dimmer is designed to automatically compensate for general overload conditions and withstand full short circuit faults without damage.

Variations in supply and other control systems injecting frequency-based signals onto the mains can all have potentially detrimental effects on many dimming products. Clipsal has paid much attention to ensure the Professional high powered dimmers provide precise, accurate and smooth dimming, regardless of all common external influences.



Telekom, Malaysia

With modern spaces, reconfiguration is a regular occurrence and it is common for lighting loads and quantities to be frequently altered. In such cases, fixed format dimmers with pre-defined load sizes and numbers are limiting and potentially costly. By providing additional flexibility in channel quantity and the opportunity to mix and match load size, Clipsal's Professional high powered dimmers provide the flexibility demanded by commercial environments today.

Clipsal's Professional high powered dimmers are also ideally suited to control electronic transformers, used for low voltage halogen lighting, as no de-rating is required.

Easy Installation, Commissioning and Maintenance

In the commercial environment, installation time, ease of commissioning and maintenance requirements are all important factors in determining true cost when providing dimming applications.

Clipsal consider that all its products should be easy to install, commission and maintain. Our focus has been upon all aspects in the design of the Professional high powered dimmer, from mounting the product, to marshalling field wiring and connecting control system cables. With the Professional high powered dimmers the installation time and ongoing maintenance is minimised, thus reducing the overall ownership costs of these dimming products.



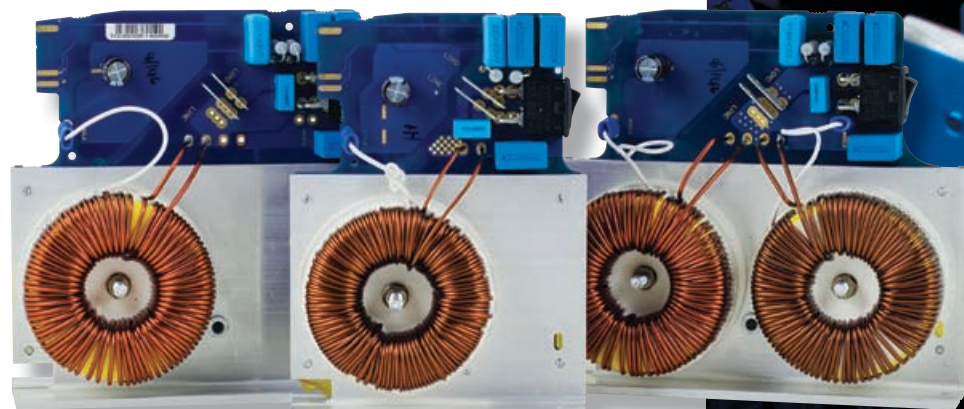
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FIELD INTERCHANGEABLE CHANNEL CARDS

Clipsal C-Bus Professional high powered dimmers provide a wide range of features to simplify all aspects of commercial applications, from product selection through to the installation and operation.

Specific innovative features include:

- The modular channel cards are an innovative aspect of the new range, providing numerous benefits for specifiers as well as installers and end users:
 - Channel cards are provided in a range of sizes from 3 Amp to 20 Amp. These cards can be mixed together in a single dimmer if required, to permit wider flexibility in rating the whole unit.
 - Each channel card has individual overload protection and is capable of sustaining full fault current.
 - Each channel card has an individual load bypass switch, completely bypassing all electronics and allowing the load to be forced on.
 - Channel cards are field upgradable without disturbing field wiring. This allows fast easy repair, if needed.
 - Leading edge 3A and 5A channel cards use Triac based switching technology.
 - Leading edge 10A, 16A and 20A channel cards use dual SCR based switching technology.
 - All channel cards use the latest phase control dimming techniques. These provide highly efficient dimming whilst maintaining precise control.



FLEXIBLE OPTIONS FOR RCD PROTECTION

A wide range of models are available with built in options for RCD protection to the latest requirements of AS/NZS3000:2007.

The rules defined by this standard are very specific about the requirements for protection of final sub circuits by RCDs, where they are used for lighting.



The standard states in clause 2.6.3.2, for installations other than domestic installations –

“Additional protection by RCDs with a maximum rated residual current of 30mA shall be provided for final sub circuits supplying- “...“One or more lighting points and having a rated current not exceeding 20A.”

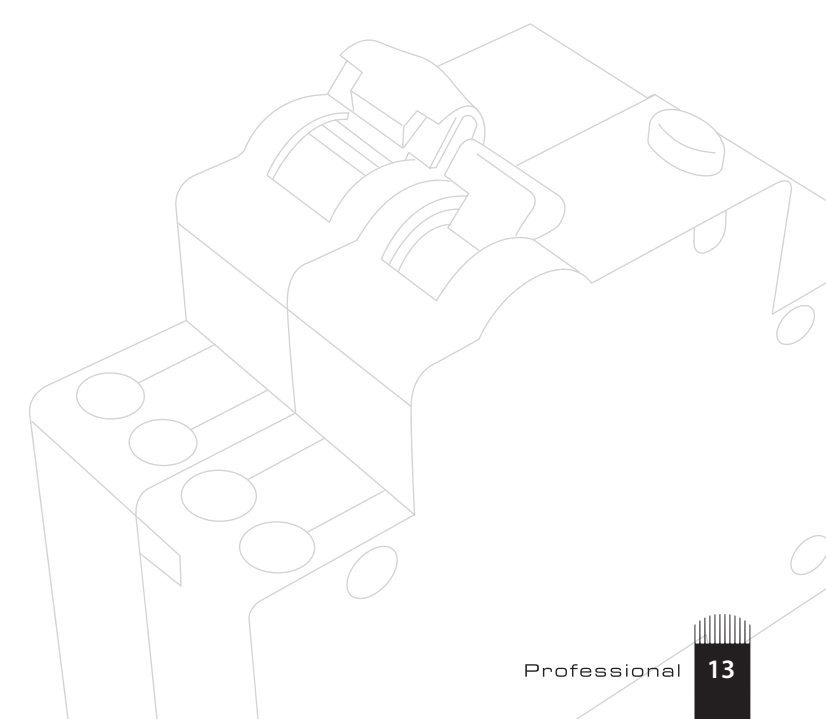
The standard also states in clause 2.6.2.4 (a) – “Not more than three final sub circuits shall be protected by any one RCD.”

For installers this means that if the dimmer product selected has more than three channels and no onboard RCDs, then these will need to be installed in the secondary circuits feeding the loads.

All Clipsal Professional high powered dimmers over 5 Amps per channel, are available with onboard RCDs as standard, meeting or exceeding the requirements of AS/NZ3000:2007.

Channels	3 Amp	5 Amp	10 Amp	16 Amp	20 Amp
3 Channel	External RCD	1 RCD	1 RCD	N/A	1 RCD
6 Channel	External RCD	3 RCDs 6 RCDs	3 RCDs 6 RCDs	N/A	6 RCDs
12 Channel	External RCD	6 RCDs 12 RCDs	6 RCDs 12 RCDs	12 RCDs	12 RCDs

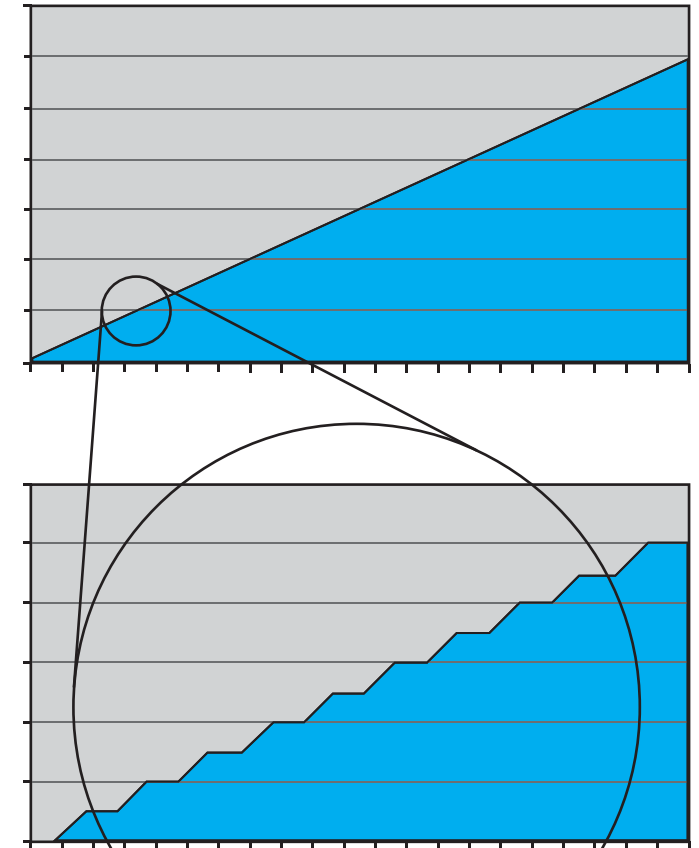
3 Amp Professional high powered dimmers are designed to be supplied via an external RCD protected source. Models without RCDs are available for markets where these requirements do not exist, or for retrofit situations where RCD compliance is not required.



OPERATIONAL FEATURES

- The leading edge channel cards are provided with a fixed bypass switch. This switch enables the control system to be fully bypassed for testing and pre-commissioning operation. It also allows localised operation in the event of a system or channel card failure. The bypass switch completely segregates all control components and ensures the load can be enabled, regardless of control status.
- If excessive load is drawn on a circuit or an over temperature condition occurs for any other reason, the dimmer channel card will automatically reduce the output power for as long as the condition exists.
 - The leading edge channel card design is sufficiently robust to withstand the full short circuit fault current, allowing time for the associated MCB to operate, to protect the circuit.
 - As the circuit overloads, the channel card will detect a rise in temperature and will automatically reduce the output current to compensate.
- All channels incorporate soft load turn-on to protect lamp filaments.
 - The soft start function is built into each dimmer channel card.
 - Soft starts are valuable for some types of lamps. A cold tungsten filament for instance, has a much lower resistance (by a factor of 8-10) than a hot filament. This lower resistance creates a large inrush of current. This inrush, coupled with uneven filament wear causes local temperature hotspots during startup. The result is evaporation of the thinner filament sections. Soft start can make a sizeable difference to the life of a tungsten lamp.
- For C-Bus Professional high powered dimmers there is an inbuilt soft start protection. This slows the delivery of current to the lighting load, spreading the start over 220mS. This slower start allows the filament to warm through, before being subjected to full load and therefore reducing wear.
- The dimmer incorporates voltage compensation over the majority of the dimming range to minimise load brightness variation if the AC supply voltage drifts from its nominal value.
 - By automatically adjusting the conduction time C-Bus Professional high powered dimmers are able to eliminate brightness variations caused by fluctuations in the incoming supply voltage.
- The dimmer incorporates specific filtering, to reduce load brightness fluctuations that are typically associated with the presence of AC supply voltage signalling.
 - By closely monitoring and filtering the zero crossing point of the phase curve, C-Bus Professional high powered dimmers are able to offer a high degree of immunity to brightness fluctuations caused by signals injected on the mains by other control systems.
- In the event of AC supply voltage failure, real time dimming output levels are stored. When power recovers the dimmer can be configured to:
 - Restore each channel to the real time dimming output levels.
 - Restart each channel to any installer-configured value from 0% to 100%.
- A permanent, un-switched emergency lighting output is available on each channel.
- The 10% to 90% rise time for the leading edge channel card is in excess of 200µS.
 - Clipsal dimmers are tested at:
 - > their full rated load
 - > the specified supply voltage
 - > a 5ms conduction angle
 - > and using an incandescent load.

- Ultra smooth dimming curves.
 - With all digital control systems, analogue values need to be transmitted as digital data. This can lead to the smooth dimming curve being perceptible as a sequence of steps, particularly at the lower end of the dimming range.
 - Clipsal C-Bus uses innovative analogue control technology to eliminate this issue in the Professional high powered dimmers.
 - Rather than relying on the digital control value being sent directly to the external control output, the Professional high powered dimmer uses analogue control techniques. This sends a super smooth sequence of values on every half cycle of the incoming mains frequency.
 - This leads to the smoothest of dimming performances, with no discernable steps at any point across the dimming curve.



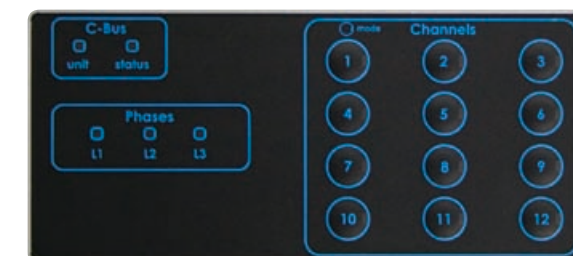
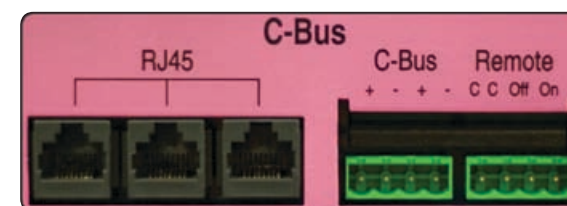
Icebergs Dining Room and Bar, Sydney (Image courtesy of Lazzarini Pickering Architetti)

INSTALLATION FEATURES

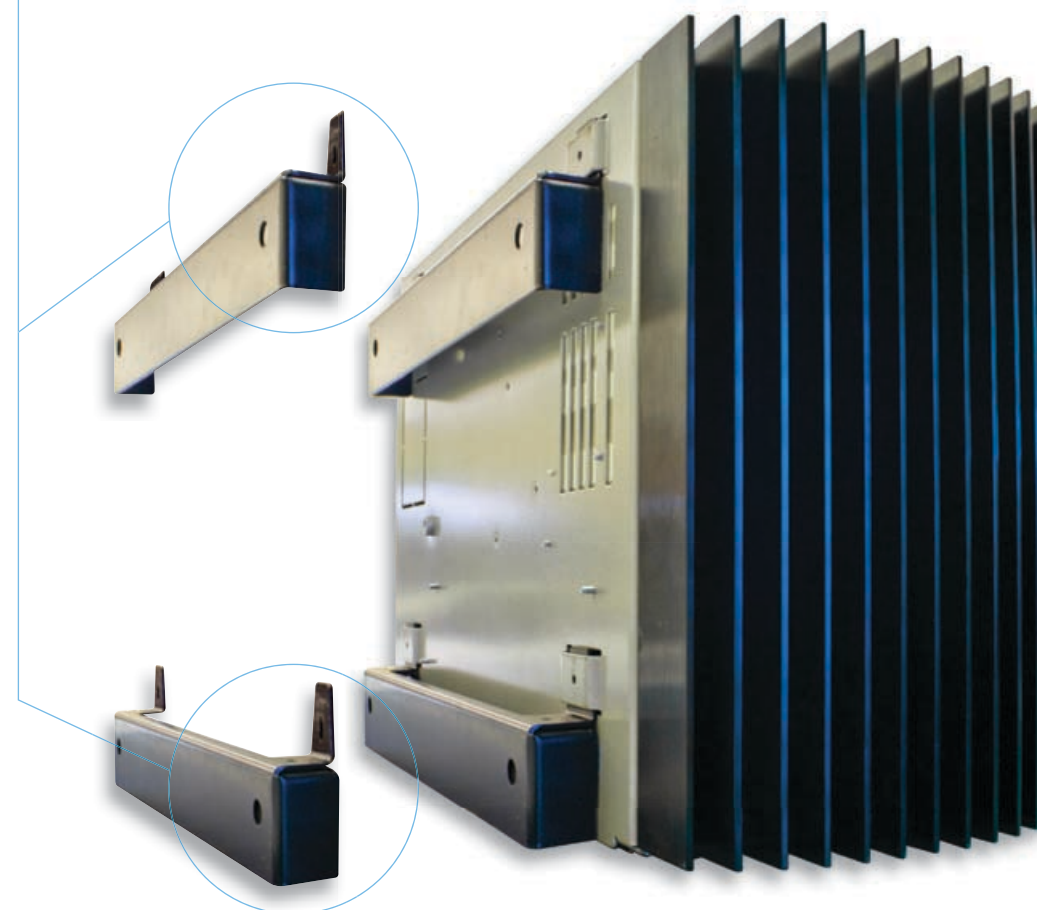
- Dimmer installation is greatly simplified by the use of an innovative design of wall bracket. This bracket is designed to fix to the wall independently of the dimmer, allowing the heavier item to be offered up onto the bracket for easier installation.
- The wall bracket allows weight load to be distributed, permitting more flexibility in wall construction to support the dimmer.
 - Wall brackets enable the dimmer to be mounted on solid as well as timber/steel walls.
 - The brackets provide a 25mm stand-off for the dimmer from the wall surface, easing cable management and installation.
 - Full mounting template supplied.
- Generous termination allowance with ample marshalling room.
 - Special attention has been paid in the dimmer design to allow for cable termination and management within the dimmer enclosure.
 - Terminal sizes are generous and are designed to ensure adequate termination space for the contractor.
 - DIN rail mounted terminations provide robust termination for field cables.
 - Accommodates up to 25mm² incoming cables.
 - Accommodates up to 2x4mm² outgoing cables.
 - Both the internal dimensions and layout of the dimmer enclosure have been carefully considered. They include multiple rear, top and bottom entry points to ensure cable management is simple, practical and neat to arrange.
 - Removable lid with slotted escutcheon provides for easier access during installation.

C-BUS SPECIFIC FEATURES

- The C-Bus Professional dimmers have a software-selectable C-Bus network burden and a network clock generator.
- Multiple external C-Bus connectors.
 - Multiple connections allow for simple interconnecting and daisy chaining Professional high powered dimmers and other C-Bus products together.
- At the C-Bus group address level, output load voltage variation follows the input control in a linear fashion.
- Local C-Bus override switches on front panel.
- Channel status indicators on front control panel.
 - For all cards, fault conditions are reported on a per channel basis.



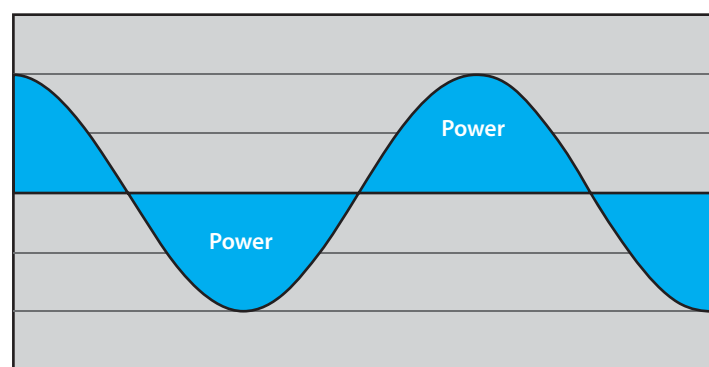
Wall brackets enable the dimmer to be mounted on solid as well as timber/steel walls.



THEORY OF DIMMING

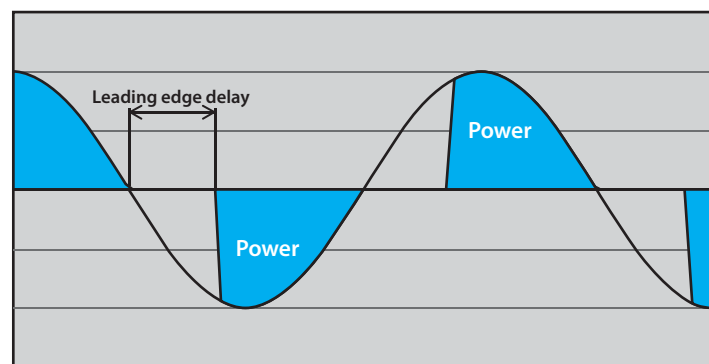
All dimmers use electronic circuits to regulate the amount of average power applied to a lighting load. These circuits use different semiconductor components, depending upon the lighting load type to be dimmed.

In an AC waveform, the power derived and therefore the brightness of the lighting load is proportional to the area under the curve on both sides of the central axis.

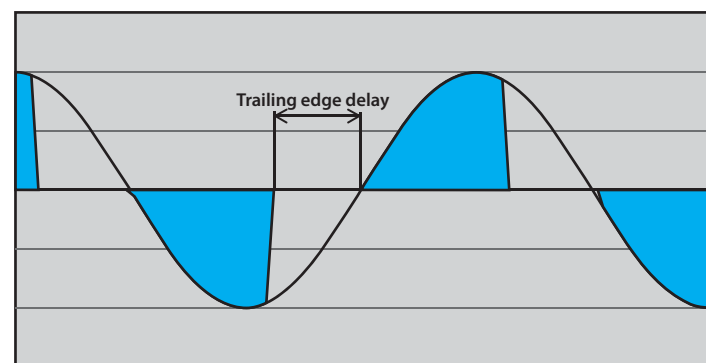


Most dimmers use a technique known as phase angle control to effect dimming control over the load. Phase angle control uses the switching characteristics of semiconductors to alter the shape of the AC waveform. There are two main types of phase angle control, leading edge and trailing edge.

In leading edge control, shown below, the start point at which the load is switched on for each half-wave cycle is delayed. This delay reduces the area under the curve and therefore the power output of the dimmer channel.



In trailing edge control, shown below, the AC current is switched off early. This again reduces the area under the curve and therefore the relative power output of the circuit.



Dimming technology uses these two different methods because one approach does not suit all types of loads encountered.

Different loads vary in their electrical properties, for example;

- Some are substantially resistive loads, like simple incandescent light globes.
- Some loads like low voltage halogen globes use a transformer to derive their required voltage from the mains feed. These transformers introduce more complex electrical properties to the load seen by the dimmer.
- Cold cathode and neon lighting catered for.

LEADING AND TRAILING EDGE DIMMERS

Magnetic Transformers and Inductive Loads

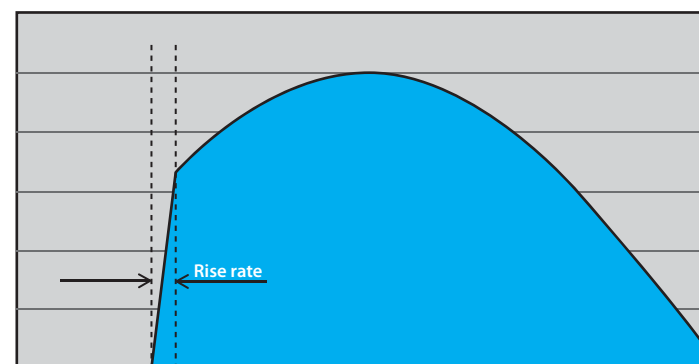
If the transformer is a standard magnetic or iron core transformer with a wire-wound coil, it introduces inductance to the load. This inductance changes the way that the current is drawn through the circuit. With an inductive load, current rises slower and exhibits a degree of inertia once established. This effect means that inductive loads are not suitable to be controlled by trailing edge dimming, as the inertia of the current can result in substantial back EMF across the load and dimmer as the phase cut occurs. Therefore inductive or magnetic transformers are dimmed using leading edge dimming technology.

Capacitive Loads

There are several types of transformer on the market that make use of electronic switch mode technology to create the required secondary voltage for the load. These transformers are generally capacitive, rather than inductive in nature. This capacitance creates current spikes when driven from a leading edge dimmer. The net effect is to create buzzing in the transformer and to generate EMC noise. These types of transformers therefore are not usually controlled with leading edge technology and would normally be controlled using trailing edge or universal solutions such as those provided by the Clipsal C-Bus range of Architectural high powered dimmers.

Rise Time and Leading Edge Dimmers

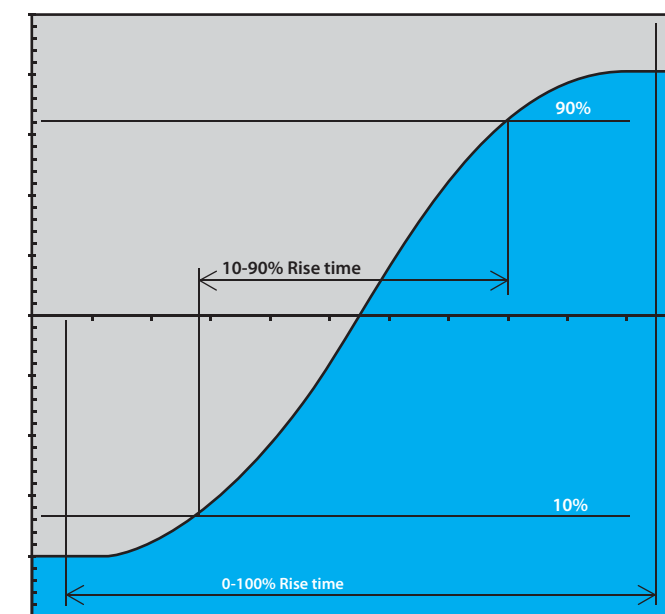
One issue experienced with leading edge dimming is caused by the sharp rise time of the leading edge in each AC half cycle, voltage waveform applied to the load. This steep rise can cause the filaments in some load types, notably incandescent bulbs, to "sing". It can also generate higher levels of induced electrical noise in audio circuits often associated with theatrical equipment used in event staging. In thyristor or SCR controlled dimmers this effect is controlled by the introduction of an inductor to the dimmer channel to slow this sharp rise rate and therefore reduce the effect to an acceptable level.



In reality, the rise time curve in a thyristor-based dimmer is more complex than shown in this simple diagram. A more precise definition of rise time is required to be able to accurately compare different dimmer performances.

The curve is actually an "S" curve and the generally agreed standard of measurement is to quote the rise time from 10% to 90% of voltage. This eliminates the longer periods where the curve is more flattened at each end.

For acceptable behaviour the rise time should be in excess of 200µs between 10% and 90%. If this figure were quoted across the whole curve from 0 to 100%, it would yield a result of 350 to 400µs, which would be misleading.



For rise time, dimmer channels are tested at:

- their full rated load.
- the specified supply voltage.
- a 5ms conduction angle.
- using an incandescent load.

USE WITH LOW VOLTAGE TRANSFORMERS

There are two different general types of transformer technologies used when installing safe extra low voltage (12V) tungsten halogen lighting.

Wire-Wound Transformers

These transformers are also known as “ferro-magnetic” or “iron-core” transformers. They are constructed from copper wire wrapped around an iron-core and have been used in the electrical industry for many years. They are generally suitable for dimming applications when used in conjunction with dimmers that use “leading edge” phase angle control. These transformers are less efficient due to core/winding losses. This inefficiency combined with an additional primary magnetising current, means that total primary current is larger than that calculated by the secondary load alone. This leads to the necessity for all manufacturers to marginally de-rate a dimmer when using this type of transformer. Typically the de-rating here is limited to around 10%.

Electronic Transformers

The use of electronic transformers in conjunction with 12V tungsten halogen lighting has become commonplace. Electronic transformers are generally more suited for dimming applications when used with dimmers that use “trailing edge” phase angle control. Electronic transformers that require trailing edge dimming are not suitable for use with the Professional high powered dimmer. For applications that require trailing edge dimming Clipsal provides universal dimming technology solutions in the Architectural range of high powered dimmers.

Many electronic transformers can be used with leading edge type dimmers; these are typically marked upon the transformer. Many dimmers available from other manufacturers require an appropriate de-rating of the dimmer to accommodate for the transformer losses.

Due to the advanced design of the new Professional high powered dimmer, no de-rating for electronic transformers is required.

LOW VOLTAGE TRANSFORMER COMPATIBILITY

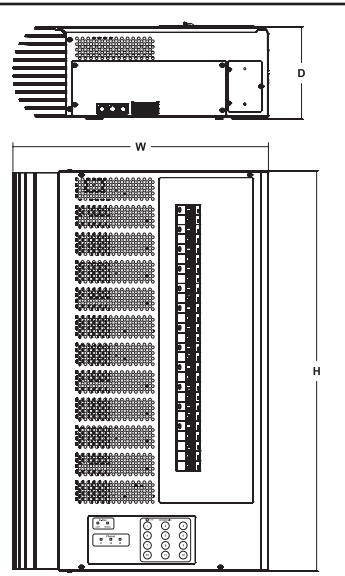
During development of the Professional high powered dimmer, Clipsal tested numerous manufacturers’ electronic transformers to establish their compatibility. These tests were used to enable the advanced design of the new dimmer range. As a result of the large number of electronic transformer models that are now available on the market, and the ongoing changes in product specifications made by manufacturers of electronic transformers. Clipsal recommends that customers contact the electronic transformer manufacturer (or distributor) to establish the preferred dimming method of a particular electronic transformer.

Unlike the majority of our competitors Clipsal recognises that loads; where electronic transformers of leading edge type are mixed with wire wound transformers, often occur. For this reason we have designed the Professional high powered dimmer so that any number of wire wound and leading edge load types can be mixed on a channel.

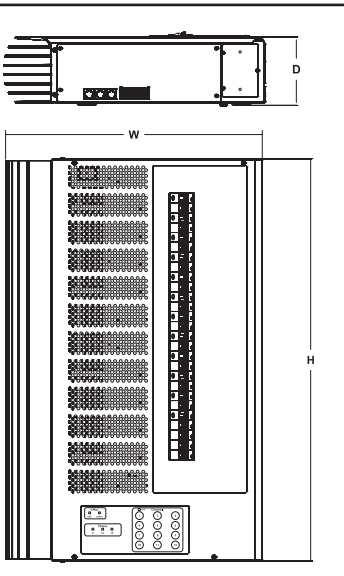
The issues related to use of capacitive transformers with leading edge control remain, so capacitive transformers may exhibit buzzing and any required de-rating for the magnetic transformers needs to be considered.

DIMMER SPECIFICATIONS

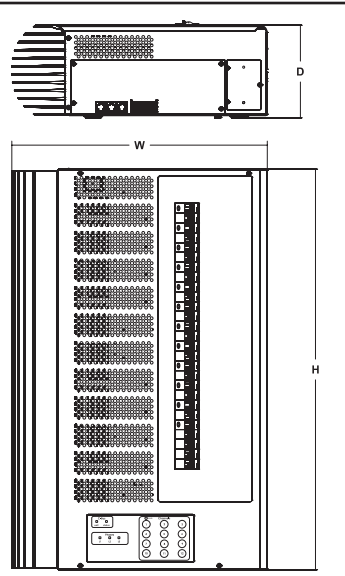
12 Channel		Part Number	
20A per channel		L5112D20LP	
16A per channel		L5112D16LP	
20A per channel with 12 x RCDs		L5112D20LPR12	
16A per channel with 12 x RCDs		L5112D16LPR12	
Supply Phases	Max Unit	Weight (kg)	Dimensions (mm)
3 Phase	180A	40	455W x 713H x 164D



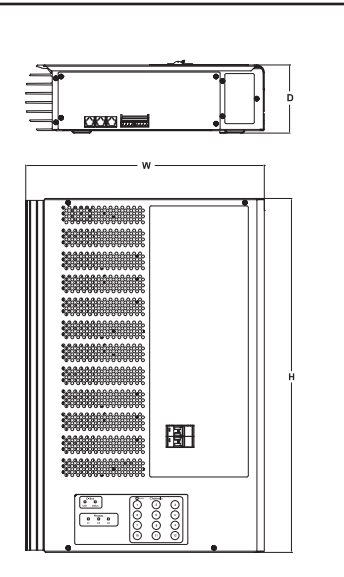
12 Channel		Part Number	
5A per channel		L5112D5LP	
5A per channel with 6 x RCDs		L5112D5LPR6	
5A per channel with 12 x RCDs		L5112D5LPR12	
Supply Phases	Max Unit	Weight (kg)	Dimensions (mm)
3 Phase	60A	26	405W x 713H x 115D



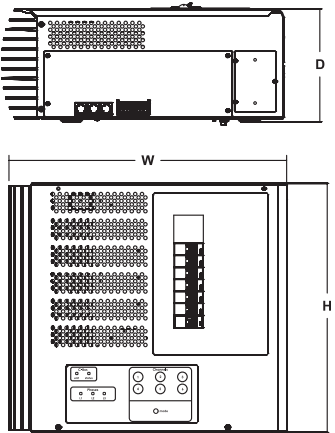
12 Channel		Part Number	
10A per channel		L5112D10LP	
10A per channel with 6 x RCDs		L5112D10LPR6	
10A per channel with 12 x RCDs		L5112D10LPR12	
Supply Phases	Max Unit	Weight (kg)	Dimensions (mm)
3 Phase	120A	31	412W x 713H x 164D



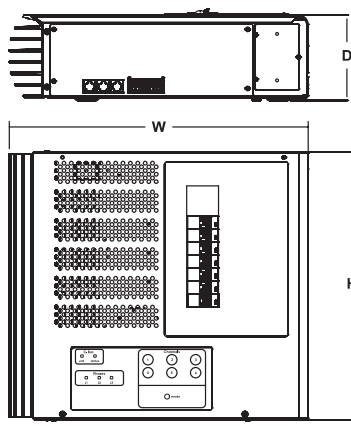
12 Channel		Part Number	
3A per channel		L5112D3LP	
Supply Phases	Max Unit	Weight (kg)	Dimensions (mm)
1 Phase or 2 Phase	36A	23	405W x 602H x 115D



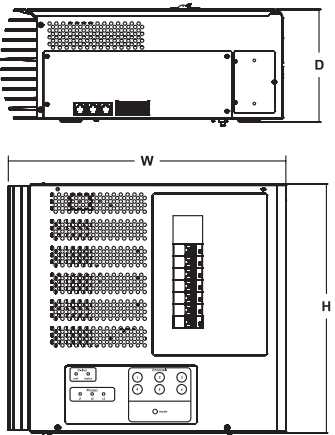
6 Channel		Part Number	
20A per channel		L5106D20LP	
20A per channel with 6 x RCDs		L5106D20LPR6	
Supply Phases	Max Unit	Weight (kg)	Dimensions (mm)
3 Phase	120A	27	455W x 451H x 164D



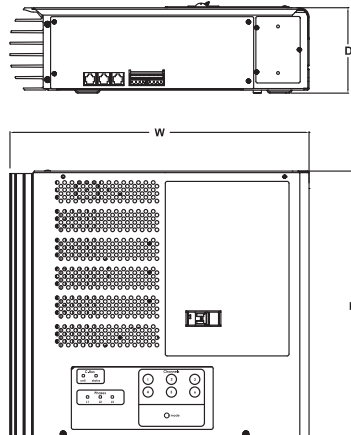
6 Channel		Part Number	
5A per channel		L5106D5LP	
5A per channel with 3 x RCDs		L5106D5LPR3	
5A per channel with 6 x RCDs		L5106D5LPR6	
Supply Phases	Max Unit	Weight (kg)	Dimensions (mm)
1 Phase or 3 Phase	30A	18	405W x 451H x 115D



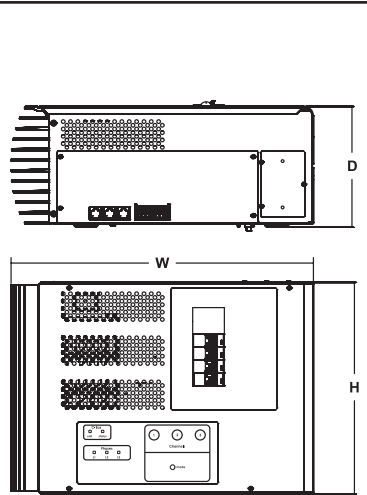
6 Channel		Part Number	
10A per channel		L5106D10LP	
10A per channel with 3 x RCDs		L5106D10LPR3	
10A per channel with 6 x RCDs		L5106D10LPR6	
Supply Phases	Max Unit	Weight (kg)	Dimensions (mm)
3 Phase	60A	21	412W x 451H x 164D



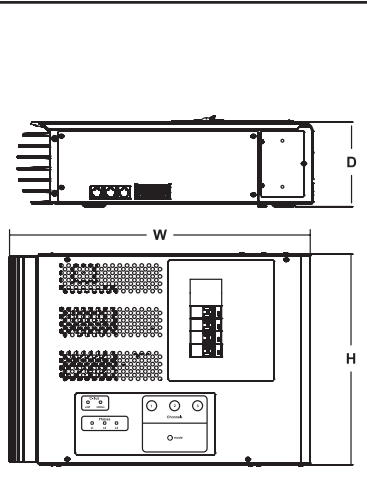
6 Channel		Part Number	
3A per channel		L5106D3LP	
Supply Phases	Max Unit	Weight (kg)	Dimensions (mm)
1 Phase	18A	16	405W x 358H x 115D



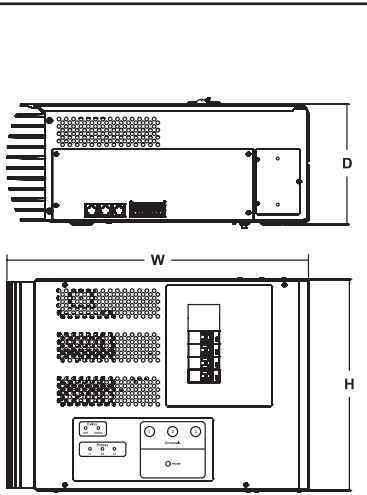
3 Channel		Part Number	
20A per channel		L5103D20LP	
20A per channel with 1 x RCD		L5103D20LPR1	
Supply Phases	Max Unit	Weight (kg)	Dimensions (mm)
3 Phase	60A	15	455W x 289H x 164D



3 Channel		Part Number	
5A per channel		L5103D5LP	
5A per channel with 1 x RCD		L5103D5LPR1	
Supply Phases	Max Unit	Weight (kg)	Dimensions (mm)
1 Phase	15A	10	405W x 289H x 115D



3 Channel		Part Number	
10A per channel		L5103D10LP	
10A per channel with 1 x RCD		L5103D10LPR1	
Supply Phases	Max Unit	Weight (kg)	Dimensions (mm)
1 Phase or 3 Phase	30A	12	412W x 289H x 164D



Parameter	Description
Load terminal standby leakage current	< 10 mA leading edge
AC supply voltage	240/415V a.c.
AC supply frequency	47 to 53 Hz
Number of input phases	1 phase (3 Amp model) 1 or 2 phase (10 Amp model) 3 phase (other models)
Minimum load/channel	20 W for incandescent
Dimming technology	Leading edge 3-5 A Triac Leading edge 10-20 A Dual SCR
Soft-start ramp time	0.220 sec
Load current rise time	200 µs
Power control range	1.5% to 95%
Standby AC supply current	90 mA base current 75 mA each LE channel
Short circuit withstand strength	6 kA
Rated insulation voltage	500V
Dielectric test voltage	2500V



by Schneider Electric

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CLIPCOM 18401 March 2009