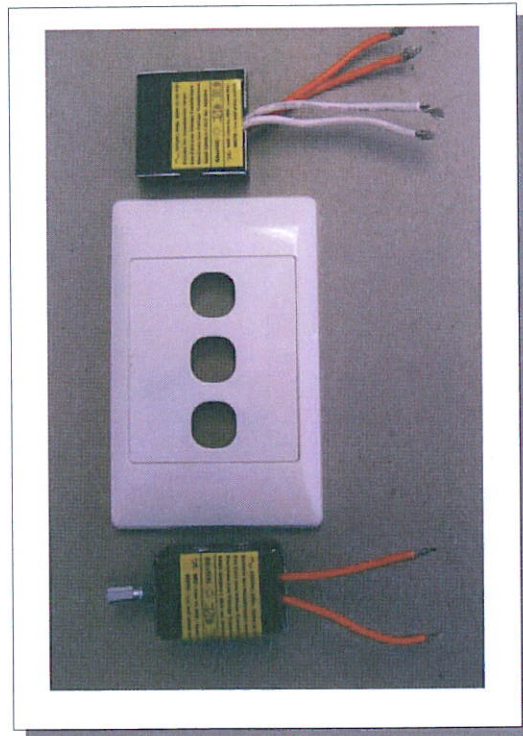


SHUTTLE “SLIM DIMMER” TRAILING EDGE DIMMERS

MODEL 3.0 – 500W, 600W and 800W



Technical specifications – bell-press

Technical specifications – rotary

Pre-set settings

Adaptive short-circuit protection

Inductive or wire wound transformer compatibility

Electronic transformer compatibility (with adaptive compensation)

Wiring diagrams

TECHNICAL SPECIFICATIONS – BELL-PRESS

ELECTRICAL SPECIFICATIONS

Operating Voltage	190-253VAC, 50Hz ±5%		
Dimming Method	Trailing Edge		
Maximum Load Power	500W	600W	800W
• Resistive	500W	600W	800W
• Inductive	400W	480W	640W
• Electronic Transformer	500W	600W	800W
Minimum Load Power			
• Resistive	10W	10W	10W
• Inductive	No Minimum	No Minimum	No Minimum
• Electronic Transformer	20W ⁽¹⁾	20W ⁽¹⁾	20W ⁽¹⁾
Electronic Transformer Compensation	Yes, adaptive control (see text)		
Retain Memory After Power Failure	Yes ⁽²⁾		
Short Circuit Protection	Yes adaptive control with constant monitoring		
Overload Protection	Yes, max. power limited to 1.4 – 1.9 of load		
Thermal Protection	Yes, thermal cut-out with 30s hysteresis		
Brown-Out Protection	Yes		
High Frequency AC transient protection	Yes		
Surge Protection	Yes, 200-450mJ		

SOFTWARE FEATURES

Microprocessor Control	Yes
Soft Start and Soft Off	Yes
Bell-press Control	Continuous cycling
Pre-set Settings	Yes (50% dimming level and security mode)
Memory	Yes, returns to previous dimming level when turned on, except after a power failure ⁽²⁾

ENVIRONMENTAL

Operating Temperature	-5 - +45°C
Storage Temperature	-30 - +80°C
Maximum Housing Temperature	85°C
Relative Humidity	90% (non condensing)
Enclosure	42 x 42 x 13mm Black Aluminium

CONFORMITY

EMC	EN55015
Performance	EN61047
Safety	EN61046
SABS	0142 - SANS 60669-2-1: 2002

TECHNICAL SPECIFICATIONS – ROTARY

ELECTRICAL SPECIFICATIONS

Operating Voltage	190-253VAC, 50Hz ±5%		
Dimming Method	Trailing Edge		
Maximum Load Power	500W	600W	800W
• Resistive	500W	600W	800W
• Inductive	400W	480W	640W
• Electronic Transformer	500W	600W	800W
Minimum Load Power			
• Resistive	10W	10W	10W
• Inductive	No Minimum	No Minimum	No Minimum
• Electronic Transformer	20W ⁽¹⁾	20W ⁽¹⁾	20W ⁽¹⁾
Electronic Transformer Compensation	Yes, adaptive control (see text)		
Retain Memory After Power Failure	Yes ⁽³⁾		
Short Circuit Protection	Yes adaptive control with constant monitoring		
Overload Protection	Yes, max. power limited to 1.4 – 1.9 of load		
Thermal Protection	Yes, thermal cut-out with 30s hysteresis		
Brown-Out Protection	Yes		
High Frequency AC transient protection	Yes		
Surge Protection	Yes, 200-450mJ		

ENVIRONMENTAL

Operating Temperature	-5 - +45°C
Storage Temperature	-30 - +80°C
Maximum Housing Temperature	85°C
Relative Humidity	90% (non condensing)
Enclosure	42 x 23 x 30mm Black Aluminium

CONFORMITY

EMC	EN55015
Performance	EN61047
Safety	EN61046
SABS	0142 - SANS 60669-2-1: 2002

- (1) Most electronic transformers require a minimum load of at least 20W, but it could be higher depending on manufacturer
- (2) If the dimmer was on during a power failure, it will turn on at 50% intensity when power is restored, irrespective of dimming level before the power failure. If the dimmer was off during a power failure, it will remain off when power is restored.
- (3) The dimmer returns to the rotary-set dimming level after power is restored

PRE-SET SETTINGS

Two pre-set settings are provided for the bell-press dimmer

1 – Energy savings pre-set

When the bell-press is clicked twice the lamp intensity will go to 50%. This function is also available even if the dimmer is off. Normally when the dimmer is turned on, the intensity is automatically adjusted to the level when the dimmer was turned off, but double clicking the bell-press overrides this memory and immediately adjusts the dimmer to 50% output intensity.

2 – Security pre-set

When the bell-press is clicked five times the lamp intensity will rapidly ramp up and down twice to indicate that the security setting is activated. The lamp intensity will then be adjusted to a new random level at random times, varying between five minutes and one hour. This mode is deactivated by either turning off the dimmer or manually dimming to a new level.

ADAPTIVE SHORT-CIRCUIT PROTECTION

The Shuttle *SLIM* Dimmer ver. 3 monitors the load current continuously while the dimmer is powered on.

If a current of more than approximately 200% to 300% (supply voltage and operating temperature dependant) of maximum load current is detected for a maximum duration of 50 μ s, the dimmer will switch off for the remainder of the 50Hz AC cycle. Normal operation commences during the next AC cycle but if the current is above the threshold it reduces the switch conduction time slightly and turns off again. This is repeated for 50-100 AC cycles while the switch conduction time (lamp intensity) is reduced each time as to limit the power supplied to the low impedance. If the over current condition is still present after a number of predetermined of cycles, the dimmer will turn off for approximately 250ms and then attempts to power the load again. This complete process is repeated four times. If after the fourth attempt the current is still above the threshold the dimmer will turn off and remain off.

After removing the overload or short circuit condition, the dimmer must be turned on again by a bell-press action (bell-press dimmer version), or the potentiometer must be switched off and on again (rotary version).

During short circuit or overload conditions the 50-100-cycle 50 μ s pulses which are repeated four times with a 0.25 second delay are sufficient to fuse an accidental frayed wire short or similar condition, but is of short enough duration as to not cause a dangerously high temperature at the location of the short circuit condition.

INDUCTIVE OR WIRE WOUND TRANSFORMER COMPATIBILITY

Trailing edge dimmers are usually not completely compatible with magnetic transformers due to the energy stored in the leakage inductance of the transformer during the turn-off instance. The Shuttle *SLIM* Dimmer is however compatible with conventional magnetic transformers due to the avalanche rating of the switching device as well as the adaptive overload protection.

Usually when a magnetic transformer is connected to a conventional leading edge dimmer and operated with no load (all lamps fused), it over stresses the dimmer and might cause damage due to the excessive magnetic energy stored. During this condition it is also possible that the secondary of the transformer is shorted (for example during installation or maintenance), which normally results in the destruction of the dimmer.

The *SLIM* Dimmer will however suffer no damage due to the above abnormal conditions because of the adaptive overload and short circuit protection.

ELECTRONIC TRANSFORMER COMPATIBILITY (WITH ADAPTIVE COMPENSATION)

The Shuttle *SLIM* Trailing edge dimmer is compatible with most low voltage electronic transformers which complies to EN55014 or EN55015 EMI specifications.

Due to the EMI components related to compliant electronic transformers, the transformer represents a capacitive load to the dimmer during the turn-off instance – which is normally not a problem except when there is insufficient resistive load on the transformer to effectively discharge the equivalent capacitance. This results in the dimmer possibly not being able to synchronize properly to the AC waveform, resulting in flickering of the lamp. This type of problem can occur if there are for instance a number of electronics transformers connected in parallel, all with no load (lamps fused), except for one transformer with a 20W lamp. The effective capacitance could then be very large and causes lamp flicker.

The Shuttle Dimmer overcomes this potential problem by implementing an adaptive control loop which monitors the load and AC mains for possible synchronization errors and then applies a pre-emptive compensation algorithm. If there are then for example a number of electronic transformers connected in parallel to the dimmer and all the lamps fail except one (20W), the lamp might flicker once after which the dimmer stabilizes the overly-large-capacitance load and assumes normal operation without any lamp flicker.

The Shuttle range of dimmers have been tested with most of the popular electronic transformers available in South Africa and were found to be compatible as is shown in the table below. The testing included various conditions and combinations such as single transformer with a transformer specified minimum load, a mixture of different transformers connected in parallel (this is a particularly tell-tale test since it's possible for the different transformers to influence each other as well), a number of transformers in parallel with no load except for one transformer with a minimum load, etc.