

The Belling-Lee "Securex" miniature circuit breaker provides the three functions of circuit protection, switching and indication of state in a robust, compact, precision unit. It has a wide range of applications in all types of electrical and electronic equipment.

Like a fuse, the speed of operation of the "Securex" on overload varies inversely as the magnitude of the over-current, but the circuit breaker has the advantage of being able to withstand harmless surges without tripping. Having no fusing element, embrittlement is not a hazard and the characteristics remain constant throughout the long life of the device. A further advantage is the ability to restore a circuit rapidly after faults have been cleared.

Preferred current ratings (i.e. maximum running current values) extend from 300mA to 20 A, as detailed on page E21, and all models have a fully tropicalised finish.

The action is "trip free", which means that a circuit cannot be held closed by the "reset" button while fault conditions exist.

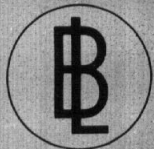
The maximum breaking capacity is 500 amp at 275 volts a.c. and 0.8 power factor for ratings of 5 amp and over, and 300 amp for ratings below 5 amp. Secondary contacts are fitted for breaking the arc under these conditions, so that the main circuit

contacts are not eroded, and a vent is provided in the case to allow for gas expansion.

Two basic types are available, the L5100 series, operating thermally, and the L5200 series, thermal-magnetically.

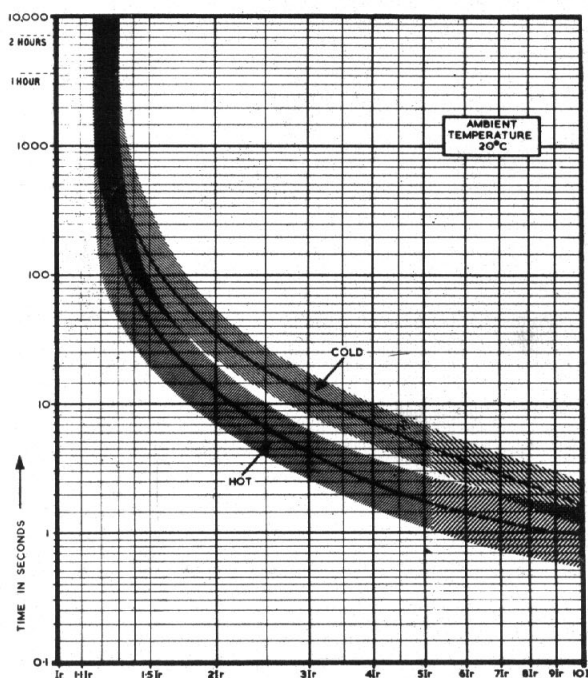
Thermal operation is triggered by the flexing of a bi-metallic element under the influence of heat generated by the passage of the current. In ratings below 2 amp a separate heating element is incorporated, but for higher ratings, the heat is generated in the bi-metallic element itself. The speed of operation in each case is governed by the rate of heat build-up in the bi-metal; this increases proportionally to the square of the current, with a delay that ranges from several minutes to one or two seconds. In circuits where large continuous fault currents can occur, a backing fuse should be included to protect the circuit breaker elements from rupturing if over-currents are likely to exceed the values given below:-

M.C.B. rating	Max. continuous over-current at 250 V a.c., 0.8 p.f.
0.3 to 1A	$10 \times I_r$
2A and 3A	$100 \times I_r$
5A to 20A	500A



## Miniature Circuit Breakers & Cut-outs

THERMAL RELEASE CHARACTERISTICS OF A  
TYPICAL BELLING-LEE MINIATURE CIRCUIT  
BREAKER

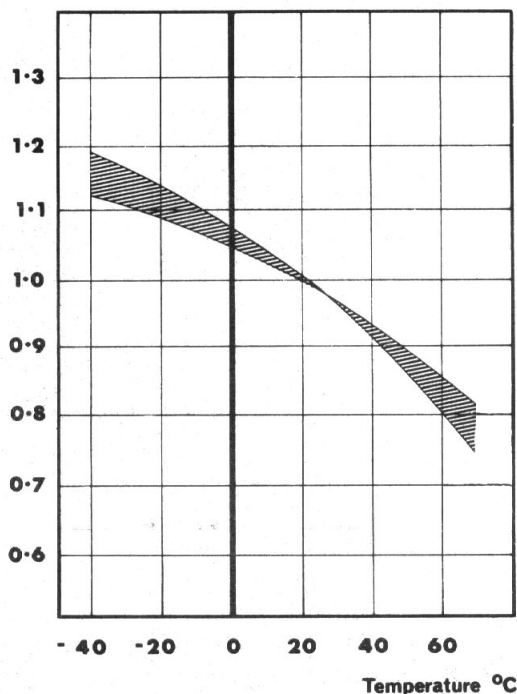


The L5200 series operates thermally on moderate over-currents, but with large fault currents (above 6 to 10 times the rated current) a magnetic coil takes charge, tripping the mechanism virtually instantaneously, i.e. in a matter of milli-seconds. This series of circuit breakers meets the majority of requirements.

The recommended standard types are panel mounted by means of a central threaded boss. However, they can be converted for plug-in mounting in switch boxes, etc., by using 4mm plug pins in place of the two terminal screws. The "reset" button has a length of travel of nearly  $\frac{1}{4}$  in, so that it projects well beyond the central boss when the mechanism has tripped, providing a clear indication of the circuit condition. An additional set of change-over contacts can be included for remote signalling, if required, and also the trip button can be omitted so that the device becomes a protective cut-out.

LIMITS OF THE  
INFLUENCE OF TEMPERATURE

Correction  
Factor



As with most thermally operated devices, unless specially compensated, ambient temperature variations will affect the performance and, when selecting a rating, it is prudent to allow for this in order to avoid false operation.

The specified rating of these miniature circuit breakers is determined at a normal ambient temperature of 20°C. At lower temperatures the rating may be increased and vice versa, and the nominal value should be multiplied by a correction factor which may be obtained from the accompanying graph.

Example: L5200/5

The rating at 20°C is 5A

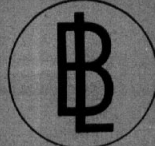
At 0°C, the correction factor is

the rating is  $1.05 \times 5 = 5.25$  A

At 40°C, the correction factor is 0.92

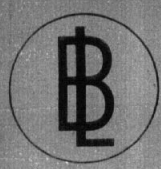
the rating is  $0.92 \times 5 = 4.6$  A

# Miniature Circuit Breakers & Cut-outs

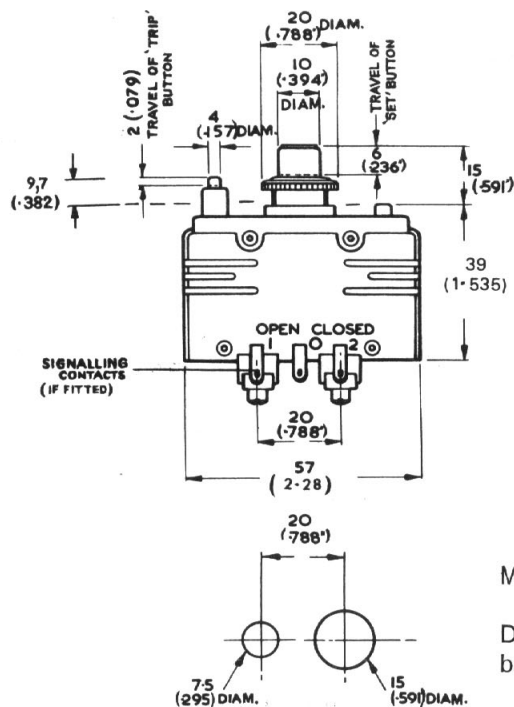


L5100 SERIES Thermal operation  
L5200 SERIES Thermal-magnetic operation

Preferred Current Ratings (Ir):	0.3, 0.5, 0.7, 1, 2, 3, 5, 8, 10, 15 and 20A The circuit breakers will hold in indefinitely on all currents up to 1.1 times the rated value							
Breaking Capacity (max.):	300A for ratings up to 3A 500A for ratings of 5A and over at 0.8 power factor							
Tripping Times:	At 1.5 × Ir < 5 min                      *At 10 × Ir a.c. < 10 m.sec At 2 × Ir < 60 sec                        * At 15 × Ir d.c. < 10 m.sec At 5.5 × Ir < 7 sec                        *Magnetic							
Breakdown Voltage (d.c.):	> 4 kV between terminals > 6 kV between linked terminals and metal panel							
Working Voltage (max.):	275V a.c. (r.m.s.) 60V d.c.							
Insulation Resistance:	> 10 <sup>3</sup> M Ω							
Insertion Resistance:	Rating	L5100	L5200	Tol.	Rating	L5100	L5200	Tol.
	0.3A	8.1 Ω	9.2 Ω	± 16%	5A	46 mΩ	50 mΩ	± 16%
	0.5A	2.9 Ω	3.3 Ω	± 16%	8A	24 mΩ	26 mΩ	± 16%
	0.7A	1.6 Ω	1.8 Ω	± 16%	10A	17 mΩ	18.5mΩ	± 25%
	1A	0.8 Ω	0.9 Ω	± 16%	15A	9 mΩ	10 mΩ	± 30%
	2A	95mΩ	0.12 Ω	± 16%	20A	6 mΩ	6 mΩ	± 50%
	3A	70mΩ	80mΩ	± 16%				
Temperature Range:	−55° to + 70°C							
Heat Cycles:	H <sub>5</sub> (DEF−5011)							
Altitude:	D <sub>1</sub> . Satisfactory to 9000 m (30,000 ft) (DEF−5011)							
Acceleration:	A <sub>1</sub> . Satisfactory to over 35 g (DEF−5011)							
Signalling Contacts: (if fitted)	Single pole change-over Max. rating 1A at 250V a.c. or 50V d.c.							
Max. Wire Size:	7/.029"							
Weight (average):	according to type, 1.9 oz (54 g) min., 2.3 oz (65 g) max.							
Types available:	List Number			Description				
	Thermal	Thermal-mag.						
	L5100/Ir	L5200/Ir		Cut-out (i.e. no "trip" button)				
	L5101/Ir	L5201/Ir		Circuit breaker (i.e. with "trip" button)				
	L5110/Ir	L5210/Ir		Cut-out with signalling contacts				
	L5111/Ir	L5211/Ir		Circuit breaker with signalling contacts				
	Ir denotes maximum running current in amp Example:− L5211/5 is a thermal-magnetic circuit breaker fitted with "trip" button and auxiliary signalling contacts for controlling a circuit in which the normal current is up to 5 amp at 20°C.							

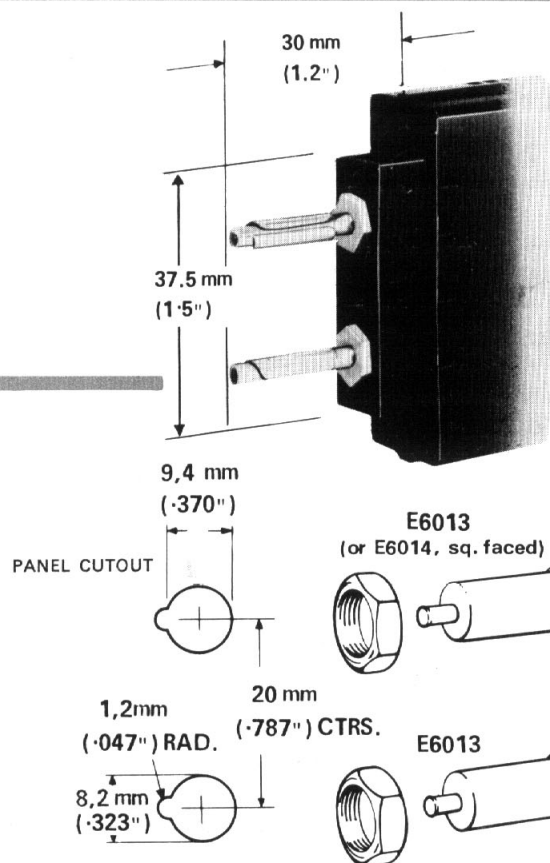


## Miniature Circuit Breakers & Cut-outs



Max. panel thickness 4mm (0.157)

Dimensions are nominal, in mm; figures in brackets are approximate equivalents in inches.



### Plug-in conversion kit, L5002

When a plug-in facility is required, e.g. on multi-purpose test rigs, etc., 2 Belling-Lee 4mm 'O-Z' plug pins and a finger guard can be fitted in place of the standard terminal screws, as shown below.

Max. panel thickness (sockets) 4mm (0.157in)