Installation and Operating Instructions

Amber Switch Type CAS-I-B and CAS-S-B

1 Introduction

Amber Switch is an automatic, electronic, frequency-sensing, operating control. It can be used in small islanded (off-grid) power systems.

This instruction leaflet covers both types of Amber Switch: Independent Type (CAS-I-B) and Load Shedding Type (CAS-S-B). Both types of Amber Switch switch on their controlled load at higher system frequency, and switch it off at lower frequency. The difference is in the available frequency settings and the time delays applied for each type (see Tables 2a and 2b). Information on which type to select can be obtained from your distributor or the Amber Control website. The Switch type is shown on the printed circuit board label inside the Amber Switch.

Common features

Amber Switches can control loads up to 15A (3.4kW at 230V; 1.8kW at 120V). Each Amber Switch is wired in series with the load it is controlling.

Both types of Amber Switch incorporate features to help ensure stable operation of an islanded power system:

- A range of setting frequencies is available to create a prioritised system
- The switch-off frequency is lower than the switch-on frequency to avoid constant switching and provide stability.
- When the frequency goes above the switch-on setting there is a delay before the load is connected.
- The delays are randomised to avoid multiple devices switching simultaneously.

Each time the Amber Switch operates, a new random time factor is chosen, to help ensure fairness across the entire power system.

Load selection and available frequency settings

Both types: Only use Amber Switches on non-essential loads (ones which can be switched off or on automatically without a problem).

Independent Type: The most appropriate loads are heaters (water heaters, storage heaters, space heaters). Appliances with pumps are not appropriate due to the potential for frequent switching of loads.

Load Shedding Type: Heaters are very suitable, and appliances with pumps, such as fridges or freezers, are also OK with this type. This is because the long switch-on delay avoids rapid on-off cycling.

Only one user-adjustable setting is provided: frequency. This is set using a dip switch (see Figure 3) which is not accessible during operation (see section 2). There are 7 selectable frequencies for the 50Hz band and 7 for the 60Hz band. Under normal circumstances it should not be necessary to adjust the setting once it has been set.

2 Installation

Amber Switch should be installed by a competent person. If in doubt consult a qualified electrician and always adhere to local regulations.

DO NOT MODIFY WIRING OR REMOVE THE AMBER SWITCH COVER UNLESS IT IS ISOLATED FROM THE POWER SUPPLY.

Mechanical

The Amber Switch comprises two parts: the base, which can be attached to a wall or panel, and the front cover, which houses the control board. Screws are supplied to ensure the Amber Switch cannot be inadvertently opened once installed.

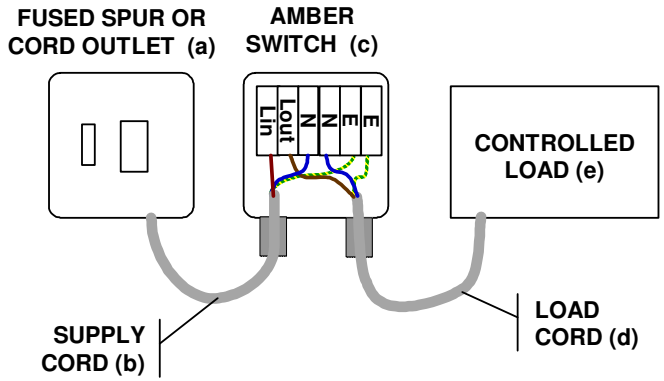
Separate the two parts by removing the screws, gently pulling the sides of the base apart and lifting off the front cover.

It is recommended that the Amber Switch is surface-mounted. The base has four pre-drilled mounting holes for this purpose.

The base has a large pushout to accommodate buried cabling if required.

The front cover has four available push-outs on the upper and lower faces for glanded flexible cords.

Figure 1 Connection of Amber Switch



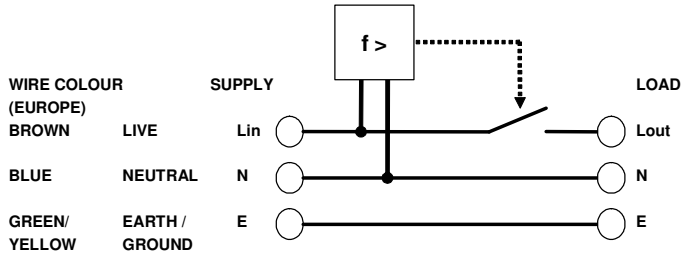
Electrical

Amber Switch can be wired directly to a fixed appliance, or to a socket which enables portable appliances to be plugged in. The term “controlled load” is used to describe both of these options.

The Amber Switch should be connected to a circuit fitted with a fuse or MCB with rating 15A or less (Figure 1) which has current ratings appropriate for the protection rating of the circuit.

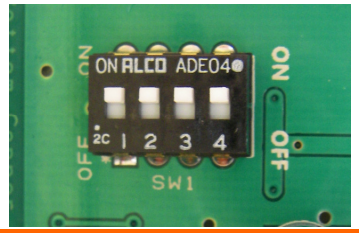
Follow any installation instructions for the controlled load, and any local regulations.

Figure 2 Schematic Arrangement and Terminal Connections



1. Isolate the working circuit from the supply.
2. Remove the front cover from the Amber Switch and mount the base (c) on the wall near the controlled load or socket (e).
3. Fit the load cord (d), either through a gland in the Amber Switch front cover or through the base. Ensure that 120mm of cord protrudes inside the base and tighten the gland to secure the cord. Strip back the sheath by 25mm and remove 5mm of insulation from each wire.
4. Repeat this for the supply cord (b).
5. Connect the supply cord (b) to the supply terminals (Lin, N and E) and the load cord to the load terminals (Lout, N and E) (Figure 2)
6. With a small screwdriver, set the frequency setting using the DIP switch, referring to Figure 3 and Table 2a (CAS-I-B) or Table 2b (CAS-S-B) as appropriate. In Figure 3 all the switches are ON (up), representing the lowest available setting. If in doubt, contact your distributor for advice on settings.
7. Ease the front cover into place on the base, and screw together.
8. Reconnect the supply circuit.

Figure 3 Setting DIP Switch



3 Operation

Indications

Two LEDs indicate the operating state of the device, see Table 1.

Table 1 LED states

LED state	System state	Load
Amber LED steady	Frequency low	Off
Amber LED flashing	Frequency high	Off, about to switch on
Green LED steady	Frequency high	On
Green LED flashing	Frequency low	On, about to switch off (applies to CAS-I-B only)
Both LEDs off	Supply to Amber Switch is off	Off

Loss and return of supply

Any load fed through the Amber Switch will switch off when the supply is lost. When the supply is restored, the load may operate momentarily while the Amber Switch powers up. After this, the appliance will be switched off while the Amber Switch assesses the supply frequency. If the frequency is above the switch-on setting the normal switch-on delay will apply and then the appliance will be switched on.

Troubleshooting

If the Amber Switch does not operate as expected:

1. isolate, and check the terminal connections are correct, and tight;
2. make sure the power supply is on;
3. isolate, and check the dip switch settings in Table 2a / 2b;
4. isolate, and try with all dip switches ON (both types should switch on with supply at 50Hz / 60Hz, after appropriate time delay);
5. contact your distributor with details of your observations for advice.

Maintenance

The Amber Switch is completely maintenance-free with no user serviceable parts. The Amber Switch should be inspected for damage or deterioration every 24 months.

4 Specification

This specification is declared in accordance with the definitions of BS EN 60730-1:2000.

Regulatory Compliance

LV Directive	2006/95/EC
EMC Directive	2004/108/EC
RoHS Directive	2011/65/EU

A CE mark is affixed to the Amber Switch indicating conformity with the above directives.

Electrical Limits

Supply voltage		205 – 255 VAC
Supply frequency	f	45 – 65 Hz
Maximum load	Imax	15 A
Rated impulse voltage		1.5 kV

Environmental Conditions

IP Rating	IP20
Ambient temperature	0 – 30ºC
No. of cycles	at least ~50,000
	depending on application
Type of load	substantially resistive
	pf ≥0.95
Mounting	independent surface mounting

Electrical connections

Cable glands	cable diameter	5 –10 mm
Stranded cable	all terminals	0.2 – 2.5 mm^2
		30–12 AWG

Characteristics

Frequency accuracy	approximately +/-0.1Hz
Automatic action	Type 1.C
	(micro-interruption)
Software class	Class A

CAS-I-B Independent Type

Table 2a Switch-On Frequency Settings for Independent Type

Setting	1	2	3	4	Setting	1	2	3	4
50.25	ON	ON	ON	OFF	**60.25**	OFF	ON	ON	OFF
50.5	ON	ON	OFF	ON	**60.5**	OFF	ON	OFF	ON
50.75	ON	ON	OFF	OFF	**60.75**	OFF	ON	OFF	OFF
51.0	ON	OFF	ON	ON	**61.0**	OFF	OFF	ON	ON
51.25	ON	OFF	ON	OFF	**61.25**	OFF	OFF	ON	OFF
51.5	ON	OFF	OFF	ON	**61.5**	OFF	OFF	OFF	ON
51.75	ON	OFF	OFF	OFF	**61.75**	OFF	OFF	OFF	OFF

Characteristics for Independent Type

Switch-on frequency	fon	50.25 to 51.75, 60.25 to 61.75 Hz in 0.25 Hz steps
Switch-off frequency	foff	< fon - 0.25 Hz
Switch-off time	toff	< 14 / (foff - f) seconds
Switch-on time	ton	< 14 / (f - fon) seconds

CAS-S-B Load Shedding Type

Table 2b Switch-Off Frequency Settings for Load Shedding Type

Setting	1	2	3	4	Setting	1	2	3	4
48.25Hz	ON	ON	ON	ON	**58.25Hz**	OFF	ON	ON	ON
48.5	ON	ON	ON	OFF	**58.5**	OFF	ON	ON	OFF
48.75	ON	ON	OFF	ON	**58.75**	OFF	ON	OFF	ON
49.0	ON	ON	OFF	OFF	**59.0**	OFF	ON	OFF	OFF
49.25	ON	OFF	ON	ON	**59.25**	OFF	OFF	ON	ON
49.5	ON	OFF	ON	OFF	**59.5**	OFF	OFF	ON	OFF
49.75	ON	OFF	OFF	ON	**59.75**	OFF	OFF	OFF	ON

Characteristics for Load Shedding Type

Switch-off frequency	foff	48.25 to 49.75, 58.25 to 59.75 Hz in 0.25 Hz steps
Switch-on frequency	fon	> foff + 0.25 Hz
Switch-off time	toff	< 1 second
Switch-on time	ton	5 - 15 minutes