# Mk-8X-RCD

**The only equipment that this inverter unit is designed to power is an MPI electro-magnetic yoke.**

**400 watt modified sine, 240-volt Inverter**

It should be noted that the MPI Yoke Inverter [Mk-8X- RCD] is RCD protected. The unit has been designed to be portable and built for use on construction sites where an RCD protected supply is not available, or a generator is not a practical option, or situations of restricted access, or rope access work and offshore construction or where extended lengths of extension cables are not permitted.

To conform to standard MPI testing techniques the unit is intended for *short time* and *intermittent* operation, not continuous; as per AS NZS 4763-2011 6.2

It is common practice to charge crawler and radiation alarm SLA, VRLA batteries in their field enclosures without venting. To comply with AS 4086.2 battery charging should be carried out with the inverter lid partially opened and the main switch OFF.

As per all site work a SWMS and JSA should cover the safety aspects of using MPI yokes especially when used in conjunction with an inverter. Personnel should be trained in use and precautions of the inverter which would then cross refer to the JSA. It is the responsibility of the company and the technician to establish that use of this equipment complies with site regulations.

Prior to carrying out MPI work the condition of the inverter, yoke and cable should be inspected and if damaged should not be used. The RCD has a test facility and should be regularly tested.

The unit is not waterproof [nor would the magnet be] and the unit is not designed for use in hazardous atmospheres and if used should be used under the requirements of a hot work permit.

http://www.safeworkaustralia.gov.au/sites/swa/about/publications/pages/managing-electrical-risks-in-the-workplace

**The RCD has two test buttons which should be checked regularly and an external RCD tester [CABAC] can be used to establish that the trip point is 30mA or less.**

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# Mk-8X-RCD

**Portable Inverter for <u>Magnetic Particle Inspection</u> using Electro-Magnets**

1. **Battery Type**: - 12-volt, 12 A-hour, Sealed Lead Acid, deep cycle.
2. **Inverter**: - 400 Watt continuous, 1,200 Watt surge. Modified sine wave 240 volts. Mk-7A isolated [floating] supply not RCD protected. **<u>Mk-8X-RCD is RCD protected</u>**
3. 12volt fused at 30 Amps. The fuse [colour coded green] is situated in the automotive relay. The 30 Amp fuse limits the power output to approximately 350 Watts.
4. A spare fuse is attached to the inverter with silicone
5. **Charger**: - **PROJECTA AC-015** 1.5A, 4 stage charger using a 3 x pin XLR DC plug and plastic socket. Charging voltage can be monitored using the installed LED [or backlit LCD] voltmeter located centrally in the lid.
6. **Power** switching to the inverter is via an automotive relay. This, in turn, is energised via an electronic timer which has a maximum limit of 999 seconds. The normal setting would be a maximum 16 minutes with the digital LED timer. Factory setting 600 seconds. The timer prevents high discharge of the battery if not in use and prevents the 240 v AC being accidentally left on.
7. **Activation:** - When the START [momentary] switch is pressed it triggers the timer which energises the automotive relay, applying 12volts from the battery to the inverter. The external power socket can be switched ON and 240v AC is available to run the magnet. A flashing LED adjacent to the START switch confirms that the timer is running.
8. **Sounder:** A pulsing sounder will activate when the main switch is on and will stop once the START button is depressed. When the 16- or 10-minute cycle is completed the sounder will operate as a reminder to switch off the inverter and conserve battery power.
9. Heavy duty rubber ribs are installed on the lid either side of the switches to prevent accidental activation of the unit should it be dropped or inverted.
10. Weight = 6.5kg
11. The 12-volt cell is restrained with M-5 screws and a full 3 axis restraint. The inverter is bolted to case using M-4 stainless-steel c/s screws. The inverter frame is plastic which ensures that no high potential can be present outside of the case through the stainless-steel screws.
12. ***<u>OPERATION</u>***

    *Depress the power **ON** switch. Voltmeter will illuminate and indicate the state of battery charge. Depress the* **START** *switch and timer will activate the main relay and bezel mounted flashing LED. The inverter is now running, switch the power output socket to **ON** and power is available to operate the electromagnet. Carry out a 4.5kg lift test to establish that battery is sufficiently charged, and that inverter is operating correctly.*

***To de-activate the inverter: depress the main ON/OFF switch which will then remove the 12v from timer and relay. In this state the* START *LED will be off and the LED voltmeter will be off.***

## ***<u>Always charge after use with the correct SLA charger!</u>***

# Mk-8X-RCD

*A modified sine wave inverter is suitable for inductive loads such as an electromagnet. It is not suitable for sensitive equipment that requires a pure sine wave. Switch-mode plug-packs such as phone chargers can have a high initial current and <u>will</u> blow the 30 Amp fuse.*
*For road and air transportation disconnect both battery spade terminals as shown in photo below and refer to MSDS item 14.*

**Powertech 400W (1200W Surge) 12VDC to 240VAC Electrically Isolated Inverter**
The unit will deliver up to 400 watts of continuous power, while supplying surge currents up to 1200 watts. DC input is through a twin 12AWG cable. The output is a standard 3 pin mains socket. There is a rocker on/off switch, and LED indicators for power and fault. This unit also features fan assisted cooling.
The application when used in the X-ray Engineering inverter unit is only for MPI electromagnets. An automotive fuse is installed in the relay circuit and is rated at 30 Amps, limiting the output to approximately 350 watts


**<u>Specifications:</u>**
Output Power Continuous: 400W
Output Power Surge: 1200W
Standby Current: < 300mA
Input Voltage: 10 - 15VDC
Output Wave Form: Modified Sine Wave
Efficiency: > 90%
Size: 182(L) x 105(W) x 60(H)mm
Weight: 0.85kg

Circuit Protection:
Thermal Shutdown and Alarm: 60°C +/- 5°C (Automatic Recovery)
Battery Low Alarm: 10.5VDC +/- 0.5VDC

Battery Low Shutdown: 10.0VDC +/- 0.5VDC
High Battery Shutdown: 15.5VDC +/- 1VDC
External Fusing: 50A Maximum

# AC-015 12-volt, 1.5 Amp, IP-65 Automatic Charger

| | |
|---|---|
| INPUT (NOMINAL) | 220VAC-240VAC, 50-60HZ |
| INPUT POWER | 24.5W |
| OUTPUT VOLTAGE | 12V |
| OUTPUT CURRENT | 1.5A |
| **CHARGING STAGES** | 4 |
| 1. BATTERY HEALTH CHECK | 1.5A UP TO 10.0V |
| 1A. STOP CHARGING | If battery voltage has not reached 10.0V within 2 hours Stage 1, stop charging. Set error. |
| 2A. BULK | 1.5A to 14.4V |
| 2B. BULK TIMEOUT, DISPLAY F4, STOP CHARGING | 22 HOURS ± 10% |
| 3A. ABSORPTION VOLTAGE HOLD FOR 30 MINS TRANSIT TO FLOAT | 14.4V |
| 4. FLOAT VOLTAGE MAX VOLTAGE IS 13.5V FOR 2 MIN OR CURRENT <0.3A, THEN OFF FOR 3 MIN. REPEAT | 13.5V for 2 mins or <0.3A then 2 mins rest, repeat |
| BATTERY VOLTAGE DROPS BELOW A SET VOLTAGE RESTARTS BULK | 12.0V |

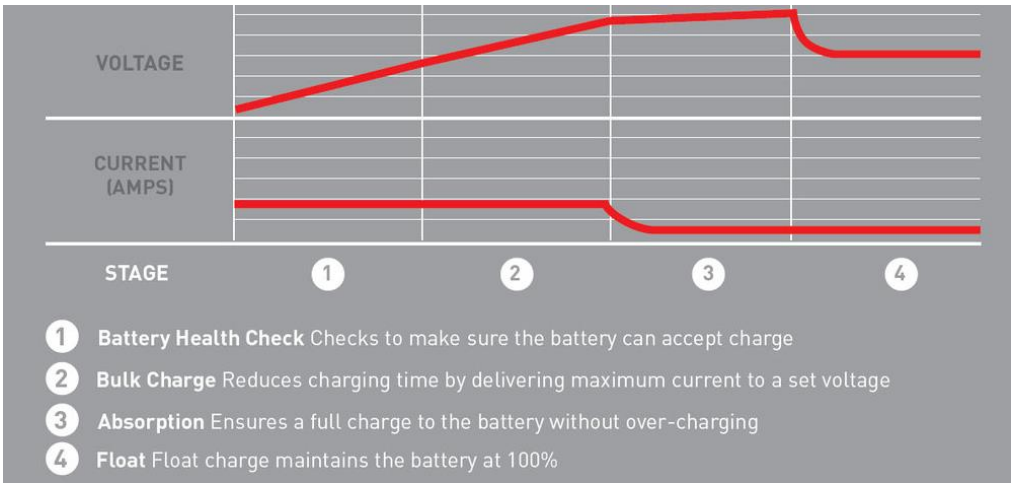



**Figure 1. Flashing LED = Charging. Permanently on = Charged**


www.powersafe.net.au/safety-device_rcd-duo/

# RCD DUO
# POWERSAFE RCD DUOTM

## DESIGNED FOR USE WITH GENERATORS, ISOLATION TRANSFORMERS AND IN ENVIRONMENTS WHERE EARTHING IS AN ISSUE.

There are many situations where a traditional RCD or RCBO does not offer protection. A traditional RCD isolates power when there is a current imbalance between the active and neutral conductors (fault to earth).
To do this the RCD generally relies on good earthing integrity and low earth impedance.
The Powersafe RCD DUO offers a much broader range of protection by operating in various earthing environments.
In the occurrence of a fault to earth, the RCD DUO is designed to isolate power on MEN, IT & T type systems.
The RCD DUO is connected to the earth circuit, which however, is not required to be grounded, so the need for earth staking generators is a thing of the past.

Generally, at 40 volts (the potential to electrocute) the device will trip at 10mA. This can be altered to meet the application at the
point of assembly.
Unlike many other devices on the market the RCD DUO has no relays or coils with moving parts, and therefore is not subject to vibrations caused by generators and transportation.

## Single Phase Protection

**Features:**

- MCB protection (over current)
- RCD protection (in MEN systems)
- DUO protection (voltage and current on earth)

**General Information about the wiring and operation of the DUO :**

The 1P + N DUO uses the active and Neutral sensor wires to monitor any voltage detection and current flow to the Earth / sensor wire. The Active and Neutral sensor wires must be located on the load side of the RCBO or circuit breaker so that power is isolated from the sensor wires on the event that there is a fault in the wiring circuit.

The 1P + N DUO is designed to trip before the potential voltage reaches 40 volts AC and/ or the current flow exceeds 30mA. Depending on the fault this may occur at lower voltages and / or current flows. When the DUO is connected to a CLIPSAL RCBO the DUO will trip the current limiting side of the circuit breaker only.

By depressing the test button on the DUO this will trip the current limiting reset toggle side of the CLIPSAL circuit breaker but isolates both Active and Neutral poles.

By depressing the test button on the RCBO it will operate both current limiting reset toggle and residual current limiting reset toggle.

On installation both test buttons should be operated to ensure that the device is operating on the DUO ESD function and also the residual current fault function. Ensure that the Earth sensing wire is connected to the earthing circuit of the appliance(s) or devices to be operated and protected.

The DUO ESD looks upstream and downstream of the RCBO for earth voltage faults otherwise the user would not be correctly protected.

It is possible to wire the DUO so it emits an alarm instead of disconnecting power in the event of the first fault of potential voltage to the earth path in situations where the disconnection of power is life threatening.

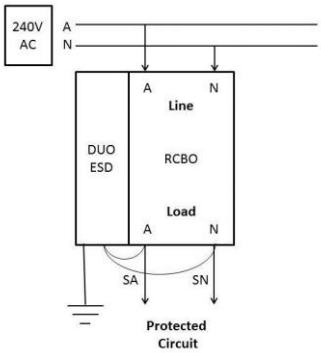


**Figure 2. Mk-8X-RCD MPI Inverter. The 2.5 mm charging plug used in previous models has been replaced with a 3- pin plastic XLR to remove the chance of an OLYMPUS 24-volt Li-Ion power supply being inadvertently used.**

**Figure 3 For transit and freight remove Red and Black battery cables by grasping the yellow spade terminals and removing from the battery. The shroud shown on the righthand side covers both GPO and RCD. The revised battery clamp secures the battery in 3 axes.**


**Figure 4. Projecta AC015 charger and XLR 3-pin charge plug replaces earlier model AC150 and 2.5mm charger plug.**

# Mk-8X-RCD

**The CABAC RCD tester is supplied to enable testing of the Powersafe RCD at the GPO or IP-66 outlet. This will establish the trip point; typically, 20-30mA.**
**It is suggested that the CABAC tester is used in preference to an electronic injection tester e.g. FLUKE 165B A-E 138VAC, A-N 240VAC, E-N 120VAC.**
**There are two test buttons on the DUO for alternative testing, however, the CABAC provides testing of all wiring and the outlet.**


**Refer to AS/NZS 3012:2012 Fig H2**

| CABAC | Switch posn | Typical Value in ohms |
|---|---|---|
| 1 | **10** | **27.9 > 28.0 kΩ** |
| 2 | **15** | **17.0 > 17.1 kΩ** |
| 3 | **20** | **12.8 > 12.9 kΩ** |
| 4 | **25** | **10.1 >10.2 > kΩ** |
| 5 | **30** | **8.6 > 8.7 kΩ** |
| 6 | **35** | **7.1 > 7.2k kΩ** |

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