DeadEasy
Operating & Maintenance
Manual

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<th>Rev</th>
<th>Date</th>
<th>Revision Description</th>
<th>By</th>
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<td>4</td>
<td>Nov 09</td>
<td>Added green blinking symptom to troubleshooting section</td>
<td>CJD</td>
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<td>Added approvals information to Specification</td>
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<td>1</td>
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<td>Label Change. Self Test Details, MCC installation constraint</td>
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<td>0</td>
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Redbusbar
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1 Warnings

Please note the following warnings in relation to the installation and operation of DeadEasy:

1. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
2. DeadEasy is suitable for use on earthed (TN) AC power systems up to 1,000VAC, 50/60 Hz. DeadEasy is not suitable for use on isolated (IT) AC power systems or DC circuits.
3. Detection and Self Test wiring must not make direct contact with Live Parts. Care should be exercised when installing detection and self test wiring to avoid electrical contact with power circuit connections.
4. DeadEasy is to be supplied from 24VDC +/- 10%. The 0VDC supply must be connected to a functional earth.
5. The DeadEasy Isolation Confirmation Procedure must be adhered to in order to correctly prove the isolation is sound and the integrity of DeadEasy. Should the lamp indications deviate from the Isolation Confirmation Procedure in any way, the power supply has been removed, an isolation breach has been detected or a DeadEasy problem has been identified. The user should call for assistance to rectify the problem with the power supply, isolation or DeadEasy prior to commencing works.
6. The use of DeadEasy is no substitute for “Testing for Dead” prior to handling electrical conductors. “Testing for Dead” is a legal requirement in most jurisdictions prior to handling electrical conductors.
7. Altering the length of the Detection and Self Testing wires may result in incorrect operation of the test device. As such this is to be avoided.
8. Materials placed between the Detection and Self Test wires may result in incorrect operation of the test device. As such this is to be avoided.
9. All wiring must be installed by a licensed electrician and in accordance with national standards.
10. To avoid hazards, the internal fuse shall only be replaced with the correct size and type.
11. High voltage stress testing of switchgear whilst DeadEasy is connected may damage DeadEasy internal circuitry. Disconnect DeadEasy prior to high voltage stress testing. Note that each DeadEasy is factory tested to withstand 1,000VDC from power circuit conductors to earth.
2 Overview

DeadEasy is a 3 phase, “Test for Dead” test device. DeadEasy tests a circuit to establish whether the AC phase conductors are alive or dead. DeadEasy aims to provide non-electrical people with a simple and safe method of verifying MCC (Motor Control Centre) based, electrical isolations before conducting mechanical maintenance.

DeadEasy confirms that equipment is disconnected from electricity. This is achieved through the use of self-checking hardware, a design emphasis on fault tolerant components and methods and a simple isolation confirmation procedure.

One power circuit requires the following equipment:

- One DeadEasy (DE30)
- One DeadEasy Human Machine Interface (DE30HMI)
- One DeadEasy Human Machine Interface cable (DE30HMIC)
- Two DeadEasy Instrument cables (DE30IC)

2.1 Features

DeadEasy offers the following features:

- **Simple Use** – 3 Step Procedure - Isolator On = Red Lamp, Isolator Off = Green Lamp, Self Test = Red Lamp. Minimal training and changes to isolation procedures.
- **Positive Result** - Lamp On = Isolated. Whereas “Pilot Lamp” solution Off = Isolated? = Inconclusive!
- **Operator Confidence** - Operator initiated Self Testing provision
- **Power System Safety** - No electrical connections, hence impact, on the power circuit
- **Inexpensive** – Similar to pilot lamps but without the safety and maintenance issues
- **Simple Installation** – 25mm wide DIN rail mount electronics, HMI incorporating LED lamps and self test request all in one only 22.5mm lamp cut-out
- **Wide Application** - Suitable for new and retrofit installations and dusty, low and high ambient light environments
- **Verifier Safety** – No exposure to live terminals in contrast to electrician confirmed, isolation verification methods
- **Flexible** – Allows subsequent verifications without reversal of the isolation ie accommodates late working parties
2.2 Description

A block diagram of a typical 3 phase switch and DeadEasy is shown in Figure 1.

The user coordinates the isolation confirmation as follows:

1. With the Power Supply energised and the Isolator on/closed/1 the red LED only should be illuminated
2. With the Isolator off/opened/0 the green LED only should be illuminated
3. With the Isolator off/opened/0 and self test activated the red LED only should be illuminated

![Figure 1](image-url)
3 DeadEasy Installation

3.1 Overview

As presented in the Section 2 overview, one power circuit requires the following equipment:

- One DeadEasy (DE30)
- One DeadEasy Human Machine Interface (DE30HMI)
- One DeadEasy Human Machine Interface cable (DE30HMIC)
- Two DeadEasy Instrument cables (DE30IC)

DeadEasy installation components and their applications are detailed in Table 1:

<table>
<thead>
<tr>
<th>Part#</th>
<th>Description</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>DE30</td>
<td>DeadEasy Controller</td>
<td>DeadEasy – Fixed Instrument includes DIN Rail Mounting</td>
</tr>
<tr>
<td>DE30HMI</td>
<td>DeadEasy Human Machine Interface</td>
<td>DeadEasy – HMI including Red and Green LEDs as well as Self Test Request equipment</td>
</tr>
<tr>
<td>DE30HMIC</td>
<td>DeadEasy Controller to Human Machine Interface Cable</td>
<td>Connecting Cable incorporating plug connections 1800L</td>
</tr>
<tr>
<td>DE30IC</td>
<td>DeadEasy Controller to Power Circuit</td>
<td>Detection/Self Test cable 1500L</td>
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Table 1

3.2 Mechanical Installation

The DeadEasy Controller comprises a DIN rail mounted enclosure. The case consumes 22.5mm of “top hat” DIN rail. A spring loaded clip on the case base allows easy installation and removal of the DE30 using a flat blade screwdriver.

The DeadEasy Human Machine Interface comprises a 22.5mm diameter circular indicator lamp. It is installed through a clearance hole for the lamp and is retained by a lamp back nut.

3.3 Electrical Installation

3.3.1 Power Supply

The required power supply for the operation of DeadEasy is 24VDC with a maximum current capacity of 0.05A.

Two off 24VDC and 0VDC terminals are provided to facilitate power supply looping. Short circuit protection per DeadEasy by way of fuse or circuit breaker is not necessary. DeadEasy incorporates an internal 1A fuse.

Electrical installation drawings for DeadEasy are located in Appendix A.
3.3.2 Detection Circuit

DeadEasy uses non contact sensing to determine whether a phase conductor is live or dead. Note that Detection and Self Test wiring must not make direct contact with Live Parts. Care should be exercised when installing detection and self test wiring to avoid electrical contact with power circuit connections.

The Detection Circuit comprises three Detection wires. Each Detection wire is attached to each phase conductor of the power circuit under test. The attachment is made by winding the Detection wire around the insulation of the insulated phase conductor. Fixing of the Detection wire at both the start and finish of the winding process ensures a high integrity attachment.

The location of the attachment of the detection wires should be single insulated, easy to access for installation purposes and greater than 100mm from exposed conductive parts.

The Detection wires are cut to the necessary length to detect voltages exceeding 50VAC. The length of the Detection wires should not be modified under any circumstances.

Installation of each Detection wire is as follows:

1. Firstly, disconnect the plug/socket connection at the instrument end. This will minimise conductor damage during Detection wire installation.
2. Attach two, loose cable ties to the phase conductor of the power circuit under test as in Figure 2.
3. Pass the Detection wire through the first cable tie up until the end point of the phase coloured heat shrink on the Detection wire. Fasten the cable tie on and at the end of the heat shrink as in Figure 3.
4. Wind the Detection wire tightly around the power conductor up until the end point of the black coloured heat shrink on the Detection wire. Fasten the cable tie on and at the end of the heat shrink as in Figure 4.

5. The Detection wire installation is now complete for this phase conductor. Repeat the process for the remaining phase conductors.
6. Finally, connect the plug/socket connection at the instrument end.

3.3.3 Self Test Circuit

The Self Test Circuit comprises three Self Test wires. Each Self Test wire is attached to each Detection wire which is attached to the power circuit under test. The attachment is made by winding the Self Test wire around the insulation of the Detection wire. Fixing of the Self Test wire at both the start and finish of the winding process ensures a high integrity attachment.

The Self Test wires are cut to the necessary length to operate the Detection circuits. The length of the Self Test wires should not be modified under any circumstances.
Placement of materials between the Detection and Self Test wires should not be performed under any circumstances.

Installation of each Self Test wire is as follows:

1. Firstly, disconnect the plug/socket connection at the instrument end. This will minimise conductor damage during Self Test wire installation.
2. Attach two loose cable ties, in the region of the Detection wire, to the phase conductor of the power circuit under test as in Figure 5.

![Figure 5 – Self Test Preparation](image)

1. Pass the Self Test wire through the first cable tie up until the end point of the phase coloured heat shrink on the Self Test wire. Fasten the cable tie before the Detection wire cable tie on the end of the heat shrink as in Figure 6.

![Figure 6 – Initial Attachment](image)

1. Wind the Self Test wire tightly around the Detection Wire up until the end point of the black coloured heat shrink on the Self Test wire. Fasten the cable tie after the Detection wire cable tie on the end of the heat shrink as in Figure 7.
2. The Self Test wire installation is now complete for this phase conductor. Repeat the process for the remaining phase conductors.
3. Finally, connect the plug/socket connection at the instrument end.

Figure 7 – Winding & Final Attachment
4 Operation

The DeadEasy Isolation Confirmation Procedure is provided with each DeadEasy in the form of a self adhesive label. The label is depicted in Figure 8.

![Isolation Confirmation Procedure](image)

Figure 8

To confirm an isolation with DeadEasy:

1. Isolator on/closed/1 the red LED only should be illuminated
2. Isolator off/opened/0 the green LED only should be illuminated
3. Isolator off/opened/0 and self test activated the red LED only should be illuminated

The “Self Test” is activated by placing an object (or the operators hand) within 10mm of the HMI/LED face. The “Self Test” is active for approximately 3 seconds. This allows the user to witness the transition from the green to the red LED and back to the green LED. This confirms that DeadEasy is still functional after it has reported the test result and therefore establishes that the isolated result, previously reported, is of high integrity.

Should the above procedure be followed and LED lamp indication is different to that identified in the procedure, a problem with either the power supply, isolation or DeadEasy has been identified. A thorough inspection of the power supply, isolation and DeadEasy should be performed by qualified electrical personnel in these circumstances.
5 Maintenance

5.1 Cleaning

To clean DeadEasy, wipe down with a soft cloth that is lightly dampened with water or mild detergent. Do not submerse in water or use chemical or abrasive cleaners.

5.2 Calibration

The Self Test function, by nature, performs a check of all external and internal circuitry. On this basis frequent calibration is unnecessary. However, a calibration check every 5 years or less is recommended.

5.3 Replacement

Easy installation, removal and replacement of DE30 and DE30HMI is afforded by plug and socket connections.
6 Specifications

Application
Short length circuit sections that are confined to within an MCC (Motor Control Centre) cell. These circuits are not exposed to electrical noise when the circuit under test is deenergised. A typical drive cell where DeadEasy is installed between a circuit breaker and a contactor would therefore be a suitable location.

Power Supply
24VDC, 0.05A, 0V Referenced to Earth

Power System Rated Voltage
1,000VAC, Referenced to Earth (TN System)

Detection Thresholds
Isolated = Phase to Earth Voltage <25VAC RMS
Energised = Phase to Earth Voltage >50VAC RMS

Testing Time
Instantaneous

Indication
Super Bright (clear when off) LEDs as follows:
- Isolated – Green
- Energised – Red

Control
Self Test Request
Object or Hand within 10 mm of HMI face

Fault Tolerance
Positive Identification of LED Lamps.

Single Fault Tolerant - In the event of any single component, cabling or connection failure the LED lamp indications nominated on the "Isolation Confirmation Procedure" label will not be satisfied

IEC61508 – SIL2

<table>
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<th>Proof Test Interval (Years)</th>
<th>PFDavg</th>
<th>Safety Integrity Level (SIL)</th>
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<tr>
<td>0.25</td>
<td>3.76x10^{-4}</td>
<td>2</td>
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<tr>
<td>0.50</td>
<td>7.51x10^{-4}</td>
<td>2</td>
</tr>
<tr>
<td>1.00</td>
<td>1.50x10^{-3}</td>
<td>2</td>
</tr>
<tr>
<td>2.00</td>
<td>3.00x10^{-3}</td>
<td>2</td>
</tr>
</tbody>
</table>

λ_{total} = 976.10 \times 10^{-9}
λ_{safe} = 804.55 \times 10^{-9}
λ_{dangerous} = 171.55 \times 10^{-9}
SFF = 82%
MTBF = 116.9 years

Size
DE30 = 25W x 100H x 115D
DE30HMI = 22.5 Diameter x 50Deep

IP Rating
DE30 = IP21
DE30HMI = IP66

Operating Temp
0° to 75°C

Approvals
Australia
- C-Tick (AS/NZS CISPR 11:2004)
Europe
USA
- FCC (CISPR 22:2006, FCC Part 15 Subpart B)

Table 3
Table 4 below aims to provide a means to quickly troubleshoot any problem that you may be experiencing with DeadEasy operations.

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Possible Cause</th>
<th>Remedy</th>
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<tr>
<td>DeadEasy does not illuminate the red LED lamp with the isolator in the on/closed position</td>
<td>DE30 24VDC is missing&lt;br&gt;Supply to the line side of the switch is either dead or there is a phase missing&lt;br&gt;One or more Detection wires have not been correctly installed or are broken&lt;br&gt;Blown DeadEasy PCB internal power fuse&lt;br&gt;DE30 24VDC is damaged</td>
<td>Apply power&lt;br&gt;Test line and load side phase voltages and reinstate supply&lt;br&gt;Check both the power circuit end and the DE30 end for correct terminations&lt;br&gt;Replace PCB fuse. Return to Redbusbar for repair</td>
</tr>
<tr>
<td>DeadEasy does not illuminate the green LED lamp with the isolator in the off/opened position. Or alternatively, DeadEasy green LED lamp is blinking with the isolator in the off/opened position.</td>
<td>High level of ambient electrical noise&lt;br&gt;DeadEasy 24VDC power supply negative is not bonded to earth&lt;br&gt;Build up of material on face of HMI&lt;br&gt;Excessive scratching of face of HMI&lt;br&gt;Incorrect isolator was isolated&lt;br&gt;Isolator is faulty&lt;br&gt;DE30 is damaged</td>
<td>Relocate DeadEasy to measure a section of the circuit that is contained within a metallic enclosure. This location should be free of other adjacent live circuits&lt;br&gt;Check that your site does not operate a floating supply policy then connect the negative DC terminal to the MCC earth bar. If the site does operate a DC floating supply policy you will need to install a DC power supply to power DeadEasy that's negative is bonded to earth.&lt;br&gt;Clean face of HMI with soft cloth&lt;br&gt;Replace face of HMI&lt;br&gt;Recheck that correct isolator was isolated&lt;br&gt;Test load side phase voltages&lt;br&gt;Return to Redbusbar for repair</td>
</tr>
<tr>
<td>DeadEasy does not illuminate the red LED lamp with the isolator in the off/opened position and the Self Test activated</td>
<td>Self Test circuit not activated&lt;br&gt;DE30 is damaged</td>
<td>Hold palm of hand within 10mm of HMI to activate Self Test&lt;br&gt;Return to Redbusbar for repair</td>
</tr>
</tbody>
</table>

Table 4