DeadEasy 32
Installation & Operation
Manual

<table>
<thead>
<tr>
<th>Rev</th>
<th>Date</th>
<th>Revision Description</th>
<th>By</th>
</tr>
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<td>5</td>
<td>Apr 18</td>
<td>Additional alarm code information. Table 4 and 5 updates</td>
<td>CD CJD</td>
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<td>4</td>
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<td>DE31 References removed, DE32 Dimension &amp; Functional Safety update</td>
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<td>May 16</td>
<td>Added Configuration section, Updated Appendix A</td>
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<td>2</td>
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1 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 provides any worker with a simple and safe method of verifying Industrial Control Panel based, electrical isolations before conducting mechanical maintenance. DeadEasy installation components and their applications are detailed in Table 1. A block diagram of a typical 3 phase switch and DeadEasy is shown in Figure 1.

<table>
<thead>
<tr>
<th>Part#</th>
<th>Description</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>DE32</td>
<td>DeadEasy Controller</td>
<td>DeadEasy – Fixed Instrument includes DIN Rail Mounting</td>
</tr>
<tr>
<td>DE32HMI</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>DE32HMIC</td>
<td>DeadEasy Controller to Human Machine Interface Cable</td>
<td>Connecting Cable incorporating plug connections 1800L</td>
</tr>
<tr>
<td>DE32IC</td>
<td>DeadEasy Controller to Power Circuit</td>
<td>Detection/Self Test cable 940L+ 250 Wrapped</td>
</tr>
</tbody>
</table>

Table 1

Figure 1 – DeadEasy Block Diagram
## 2 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 not suitable for use on isolated from earth, 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 live parts of power circuits.
4. DeadEasy is to be supplied from 24VDC +/- 10%. The 0VDC connection must be connected to a functional earth.
5. Incorrect configuration of DeadEasy DIP switches may result in DeadEasy reporting a deenergised condition ie green LED when a power phase is energised or the energised threshold voltage being higher than 50VAC RMS.
6. The DeadEasy Isolation Confirmation Procedure must be adhered to in order to correctly prove the isolation is sound in addition to the integrity of DeadEasy. Should the LED indications deviate from the Isolation Confirmation Procedure in any way, the user should contact a qualified person to rectify the problem. Until this time the isolation should be regarded as unverified and therefore unsafe.
7. The use of DeadEasy is no substitute for “Testing for Dead” or “Live-Dead-Live Check” prior to contacting electrical conductors. “Testing for Dead” or “Live-Dead-Live Check” is a legal requirement in most jurisdictions prior to handling electrical conductors.
8. Altering the length of the Detection and Self Testing wires may result in incorrect operation of the test device.
9. Materials placed between the Detection and Self Test wires may result in incorrect operation of the test device.
10. All wiring must be installed by a licensed electrician and in accordance with national standards.
11. High voltage stress testing of switchgear whilst DeadEasy is connected may damage DeadEasy internal circuitry. Disconnect DeadEasy prior to high voltage stress testing.
12. DeadEasy is a UL Listed device. This means that:
   - DeadEasy is suitable for use in Industrial Control Panels (NITW).
   - DeadEasy shall be installed in accordance with UL508A requirements.
   - DeadEasy’s use in a Motor Control Centre (MCC) is subject to approval by UL. Evaluations are made of an individual, complete unit fabricated by the MCC manufacturer, prior to UL approval.
   - DeadEasy complies with UL 61010-1 2nd Ed. DeadEasy’s Category Rating (CAT) rating is dependent on the use of UL listed or recognised insulated wire rated at a minimum of 600V incorporating a conductor size equal to or greater than 14 AWG. Refer to the Specifications section for detail.
   - DeadEasy 24VDC power supply and HMI cable shall be installed as Class 2 circuit in industrial use.
3 Installation

3.1 Mechanical Installation

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

The DeadEasy Human Machine Interface comprises a 22.5mm diameter circular indicator lamp holder. It is installed through a hole as depicted in Figure 2a and is retained by a lamp holder, back nut. Orientate the DeadEasy Human Machine Interface with the black LED on top as shown in Figure 2b.

3.2 Electrical Installation

3.2.1 Power Supply

The required power supply for the operation of DeadEasy is 24VDC with a maximum current capacity of 0.1 A. DeadEasy incorporates an internal fuse and reverse polarity protection. For this reason an external fuse or circuit breaker is not necessary to protect DeadEasy.

Electrical installation drawings for DeadEasy are located in Appendix A.

3.2.2 Master Instrument and Slave Instrument Wires

DeadEasy uses non-contact sensing to determine whether a phase conductor is alive or dead. Note that Master Instrument and Slave Instrument wiring must not make direct contact with energised parts. Care should be exercised when installing instrument test wiring to avoid electrical contact with power circuit connections.

When used on a three phase power system, the Master Instrument and Slave Instrument wiring each comprises three wires. When used on a two phase or single phase system the corresponding number of phases must only be connected. The phases not required must be disconnected and removed. DeadEasy does not require phase agreement i.e. that U phase instrument wire be attached to U phase power conductor, or that phase rotation direction be a certain orientation i.e. clockwise. Refer to Annex A for possible connection arrangements.

Each instrument wire is attached to each phase conductor of the power circuit under test. The attachment is made by winding the insulated sensing portion of the instrument wire around the insulated phase conductor. Fixing of the instrument wire at both the start and finish of the winding process ensures a high integrity attachment. The instrument wire length is calibrated to detect voltages exceeding 50VAC. The length of the instrument wires should not be modified under any circumstances. The attachment position of the instrument wires should be a location on the single insulated conductor that is easy to access for installation purposes and greater than 50mm from exposed, live conductive parts.
Installation of each instrument wire is as follows:

1. Mark one instrument wire plug at the instrument end with an “M” (Master) and the other instrument wire plug with an “S” (Slave).
2. Cable tie the Um phase, master instrument wire to the phase conductor as in Figure 3.

![Figure 3 – Master Instrument Wire Attachment](image3)

3. Cable tie the Us phase, slave instrument wire to the phase conductor independently of the master instrument wire as in Figure 4.

![Figure 4 – Slave Instrument Wire Attachment](image4)

4. Wind both instrument wires tightly around the power conductor up until the end point of the black coloured heat shrink insulation on the instrument wires as in Figure 5.

![Figure 5 – Instrument Wire Winding](image5)

5. Cable tie the master instrument wire to the phase conductor independently of the slave instrument wire as in Figure 6.
6. Cable tie the slave instrument wire to the phase conductor and trim all cable tie ends as in Figure 7.

7. The instrument wire installation is now complete for this phase conductor. Repeat the process for the remaining phase conductors (Vm, Vs and Wm, Ws) where required.

8. Finally, connect the plug connection previously marked as “M” to the top instrument terminals marked “Scn, Wm, Vm, Um”. Connect the plug connection previously marked as “S” to the bottom instrument terminals marked “Scn, Ws, Vs, Us”.

3.2.3 Digital Output

An optically isolated, transistor output is incorporated to provide indication when the power circuit is de-energised, that is on the presence of an illuminated green LED. The output is polarity conscious so care is required when connecting external circuitry. Refer to Annex A for possible connection arrangements.

3.3 Configuration

Configuration of DeadEasy can be performed using internal DIP switches. One DIP switch bank connects to the Master CPU and the other DIP switch bank connects to the Slave CPU. Switch settings must be identical on both banks. Factory default settings are as follows:

- Phase Mode – Three Phase
- Power System Frequency – 50Hz
- Digital Output on De-energised – Closed Circuit

Care must be taken to ensure DIP switch settings correspond to the power system under test otherwise incorrect and therefore unsafe DeadEasy indication may result.

Refer to Annex A for possible connection arrangements and dip switch settings.

Access to the DIP switches can be achieved by opening the case as depicted in Figure 8:
3.4 Post Installation Testing

3.4.1 First Power Up

Ensure that the power system cabling that DeadEasy is connected to is deenergised and apply power (24VDC) to DeadEasy. DeadEasy performs diagnostic tests on power up which causes momentary flashing of green and red HMI LEDs. In the event that neither the green nor red HMI LED is illuminated solid after 5 seconds, an alarm condition has been detected. Refer to the Troubleshooting section for further information. If no alarm condition is detected on power up the green HMI LED will illuminate if the power circuit is deenergised or the red HMI LED will illuminate if the power circuit is energised.

3.4.2 Function Tests

Before placing the equipment into operational service the installer should establish the correct operation of DeadEasy by performing an “Isolation Verification Procedure”. Refer to the following “Operation” section for details.

If successful, the installer should then simulate a Switch/Circuit Breaker/Supply failure and repeat the “Isolation Verification Procedure” which should confirm a Switch/Circuit Breaker/Supply problem. Simulation involves the disconnection of one Switch/Circuit Breaker load side, phase cable. With the Switch/Circuit Breaker in the on/closed position the red LED should not be illuminated and DeadEasy should timeout and report a “Detection Phase Voltage” alarm. The disconnected load side, phase cable should be reconnected, the next load side, phase cable should be disconnected, DeadEasy power cycled and the test repeated. Repeat until all three, load side, phase cables have been disconnected, tested and reconnected.

Should this “Switch/Circuit Breaker/Supply” test reveal a “Detection Phase Voltage Low” alarm with one or more phase cables disconnected, then the following possibilities exist:

- Load side power cables are too closely coupled to each other. That is, the load side cables are long or are short but are in close proximity to each other.
- Load side power cables are too closely coupled to other energised circuits. That is, the load side cables are long or are short but are in close proximity to other energised circuits.
- Power system incorporates significant harmonics.

One or more conditions may exist. Exact dimensions of “long” and “close” and are not possible as circuit geometry and proximity to earthed metal parts play an important role. The conditions may be reduced or eliminated by phase conductor separation from other phases and circuits and/or attaching insulated phase conductors to earthed surfaces. Of course harmonic mitigation techniques may also be employed.
4 Operation

DeadEasy function is as follows:

- Mains circuit is **energised** = Red LED only should be illuminated
- Mains circuit is **deenergised** = Green LED only should be illuminated

Assurance that DeadEasy provides correct indication in response to the presence or absence of mains voltages is achieved by self-testing that occurs:

- Automatically before indicating that the mains circuit is deenergised
- Automatically every 30 seconds while the mains circuit is deenergised
- Manually following a “Self Test Request” that is initiated by touching the HMI while the mains circuit is deenergised

The DeadEasy “Isolation Verification Procedure”, is depicted in Figure 9.

![Isolation Verification Procedure](image)

**Figure 9 - DeadEasy Isolation Verification Procedure**

Step 1, red LED illumination is an important step. This step when combined with step 3, green LED illumination, confirms that it is the switch that is interrupting the circuit. Step 2 describes the automatic self-testing that occurs before indicating that the mains circuit is deenergised. Step 4 and 5 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. In these circumstances qualified electrical personnel should perform a thorough inspection of the power supply, isolation and DeadEasy.

5 Maintenance

5.1 Cleaning

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

5.2 Calibration

DeadEasy performs diagnostic tests on power up, every red to green LED transition and periodically during green LED illumination. On this basis frequent calibration is unnecessary. However, a calibration check every 5 years or less is recommended.
## 6 Specifications

<table>
<thead>
<tr>
<th>Application</th>
<th>MCC drive cell/bucket where DeadEasy is installed between a circuit breaker and a contactor / VSD.</th>
</tr>
</thead>
</table>
| Environment | Altitude - 0m to 2,000m  
Temperature – -10C to 70C, 14F to 158F  
Humidity – 0% to 80%  
Use – Indoor (DE32), Indoor/Outdoor (DE32HMI Terminals/Face)  
Pollution Degree – 2 (DE32), 2 (DE32HMI Terminals), 3 (DE32HMI Face) |
| Device Power Supply | 24VDC, 0.1A, 0V Referenced to Earth. UL508 24VDC, Class 2 circuit in industrial use. Cable Minimum Rated Temperature - 75C, 167F |
| Power Supply Terminals | Conductors – 0.2 to 2.5mmsq, 24 to 12AWG.  
Tightening Torque – 0.5Nm to 0.6Nm.  
Rated Temperature – -40C to 105C, -40F to 221F |
| Power System Voltage | 1, 2, or 3 Phase, 600VAC (Line to Neutral), 50Hz/60Hz, Direct & Impedance Earthed (Non Isolated Systems) |
| Power System Safety | CAT IV, 300VAC (Line to Neutral)  
CAT III, 600VAC (Line to Neutral) |
| Detection Thresholds | Isolated = Phase to Earth Voltage <25VAC RMS  
Energised = Phase to Earth Voltage >50VAC RMS |
| Indication | Super Bright (clear when off) LEDs as follows:  
De-Energised – Green  
Energised – Red  
Fault – 2 off Amber (located on DE32) |
| Outputs | Mains Deenergised - Transistor Output, 24VDC, 100mA. |
| Control | Self Test Request  
Object or Hand within 10mm, 3/8” of HMI lens cap |
| Accessories | RightSwitch Remote Indication (Optional Extra) |
| Size | DE32 = 25W x 120H x 110D, 1”W x 4.75”H x 4.35”D  
DE32HMI = 22.5 Diameter x 50D, 7/8” Diameter x 2”D |
| Degree of Protection | DE32 Terminals = IP2X (IEC 60529 not certified by UL)  
DE32HMI = IP66 (IEC 60529 not certified by UL), NEMA 4X (UL Certified) |
| Functional Safety | Dual Channel Architecture, Single Fault Tolerant - In the event of any single component, cabling or connection failure.  
Designed to ISO 13849-1 – Category 3, PL d |
| Approvals | Australia  
C-Tick (AS/NZS CISPR 11:2004)  
Europe  
USA/Canada – UL Listed E353406  
UL 61010-1 2nd Ed  
CSA 22.2 No. 61010-1-04  
FCC (CISPR 22:2006, FCC Part 15 Subpart B) |

| Table 3 | |
7 Troubleshooting

7.1 Function Problems

Table 4 below provides a means to quickly troubleshoot any problem experienced with DeadEasy operations.

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Possible Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>DeadEasy does not illuminate the red LED lamp with the isolator in the on/closed position</td>
<td>DeadEasy 24VDC is absent Supply to the line side of the switch is deenergised DeadEasy has locked out and is reporting its alarm code</td>
<td>Apply 24VDC power Test line and load side phase voltages and reinstate supply Electrician to investigate Alarm Codes and decide on remedy based on reported alarm</td>
</tr>
<tr>
<td>DeadEasy does not illuminate the green LED lamp with the isolator in the off/opened position.</td>
<td>DeadEasy 24VDC is absent Isolation switch is faulty DeadEasy has locked out and is reporting its alarm code</td>
<td>Apply 24VDC power Electrician to investigate. Test load side phase voltages Electrician to investigate Alarm Codes and decide on remedy based on reported alarm</td>
</tr>
<tr>
<td>DeadEasy green or red LED lamp is blinking erratically without switching the isolator and self testing is not in operation</td>
<td>Power system is not referenced to earth eg isolated/IT system. DeadEasy 24VDC power supply negative is not bonded to earth High level of ambient electrical noise</td>
<td>The mains undergoing testing should be supplied from a source that’s star point is earthed directly or through an impedance. Electrician to investigate. Check that your site does not operate a floating supply policy, then connect the power supply, negative DC terminal to the earth bar. If the site does operate a DC floating supply policy you will need to install a dedicated DC power supply to power DeadEasy that’s negative is bonded to earth. Electrician to investigate. May need to relocate DeadEasy to measure a section of the circuit that is contained within a metallic enclosure. The sensing end of the detection cables should be separated/segregated from adjacent live circuits</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 DeadEasy internal fault</td>
<td>Hold palm of hand within 10mm of HMI to activate Self Test Return to Redbusbar for repair</td>
</tr>
</tbody>
</table>

Table 4

7.2 Electrician Investigation

Reference to this section should only be made following completing the “Function Problems” troubleshooting.

DeadEasy performs diagnostic tests on power up, every red to green LED transition and periodically during green LED illumination. In the event of an error being detected, DeadEasy disables all HMI indications and the digital output. The resetting of an alarm requires DeadEasy power (24VDC) to be removed and reapplied.

An error detected by DeadEasy results in the master and slave CPUs reporting their alarm codes by flashing their respective amber LEDs. Counting the number of flashes before a short pause reveals the alarm code.

Table 5 below provides a means to quickly troubleshoot any DeadEasy lockout by determining the reported Alarm Code, identifying possible causes and applying possible remedies.
<table>
<thead>
<tr>
<th>Alarm Code</th>
<th>Possible Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 – Self Test</td>
<td>Instrument cables are not plugged into DeadEasy instrument</td>
<td>Plug in instrument cables to DeadEasy instrument</td>
</tr>
<tr>
<td></td>
<td>Mismatch between master and slave instrument cable phases</td>
<td>Rewind instrument cables so that red instrument cable aligns with red, white with white, blue with blue</td>
</tr>
<tr>
<td></td>
<td>Master and slave instrument cables insufficiently coupled</td>
<td>Rewind instrument cables so that master and slave cables are tight and in close contact with each other on the phase conductor</td>
</tr>
<tr>
<td></td>
<td>Phase Mode DIP switch setting does not agree with the number of instrument cable phases installed</td>
<td>Either change Phase Mode DIP switch setting or number of instrument cable phases installed so that they agree</td>
</tr>
<tr>
<td>3 – HMI Initialisation</td>
<td>HMI cable not plugged into either DeadEasy instrument or HMI</td>
<td>Plug HMI cable into both DeadEasy instrument or HMI</td>
</tr>
<tr>
<td></td>
<td>HMI cable fault</td>
<td>Replace HMI cable</td>
</tr>
<tr>
<td>4 – Master slave CPU communications timeout</td>
<td>The other CPU has locked out and is reporting its alarm code</td>
<td>Refer to other CPU alarm code for initial alarm. It is normal that each CPU reports a different alarm. For instance the master CPU may detect an installation error and lockout prior to the slave CPU detecting the same error. The slave CPU will then detect that the master CPU is not functioning and then lockout with this alarm.</td>
</tr>
<tr>
<td>5 – Mismatch between DIP switch Phase Mode setting versus installation</td>
<td>Phase Mode DIP switch setting does not agree with the number of instrument cable phases installed</td>
<td>Either change Phase Mode DIP switch setting or number of instrument cable phases installed so that they agree</td>
</tr>
<tr>
<td>6 – Temperature Fault</td>
<td>DeadEasy instrument too hot or cold</td>
<td>Rectify enclosure temperature conditions to within temperature limits</td>
</tr>
<tr>
<td>8 - Detection phase voltages imbalance</td>
<td>AC phase voltages unbalanced</td>
<td>Test AC phase voltages and investigate voltage imbalance. Refer to Alarm Codes 8,9,10 or 14 below</td>
</tr>
<tr>
<td>9 - Detection phase angles outside of expected range</td>
<td>AC phase angles between measured phases is not 120 degrees</td>
<td>Test AC phase voltages and investigate reason why measured phase voltages may not be 120 degrees apart. Measurement is not sensitive to direction of phase rotation. Refer to Alarm Codes 8,9,10 or 14 below</td>
</tr>
<tr>
<td>10 - Detection phase voltage low</td>
<td>High level of ambient electrical noise, but not on all phases</td>
<td>Refer to Alarm Codes 8,9,10 or 14 below</td>
</tr>
<tr>
<td></td>
<td>Power system phase loss</td>
<td>Test line and load side phase voltages and reinstate lost phase (s)</td>
</tr>
<tr>
<td></td>
<td>Phase Mode DIP switch setting does not agree with the number of instrument cable phases installed</td>
<td>Either change Phase Mode DIP switch setting or number of instrument cable phases installed so that they agree</td>
</tr>
<tr>
<td>11 – Self Test Request</td>
<td>Build up of material on face of HMI</td>
<td>Clean face of HMI with soft cloth</td>
</tr>
<tr>
<td></td>
<td>Excessive scratching of face of HMI</td>
<td>Replace face of HMI</td>
</tr>
<tr>
<td></td>
<td>High ambient artificial light levels or incorrect orientation of HMI</td>
<td>Confirm by reducing external incident light falling on HMI. If green LED illuminates, correct orientation of HMI / relocate HMI to less bright location</td>
</tr>
<tr>
<td>14 – Frequency Fault</td>
<td>Low mains frequency</td>
<td>Test AC frequency and investigate under-frequency. Refer to Alarm Codes 8,9,10 or 14 below</td>
</tr>
<tr>
<td>Alarm Codes 8,9,10 or 14</td>
<td>Unearthed power system or unearthed DC power supply negative terminal</td>
<td>Refer to Table 4 DeadEasy green or red LED lamp is blinking</td>
</tr>
<tr>
<td></td>
<td>One or more Detection wires have not been correctly installed or are broken</td>
<td>Check both the power circuit end and the DeadEasy plug end for correct terminations. Ensure that no air gaps exist between power cable and detection cable.</td>
</tr>
<tr>
<td></td>
<td>High level of ambient electrical noise on some or all phases</td>
<td>May need to relocate DeadEasy to measure a section of the circuit that is contained within a metallic enclosure. The sensing end of the detection cables should be separated/segregated from adjacent live circuits. If installed on a feeder cable, cable route coupled noise may need to be addressed</td>
</tr>
<tr>
<td>15 to 21 – DeadEasy hardware</td>
<td>DeadEasy internal fault</td>
<td>Return to Redbusbar for repair</td>
</tr>
</tbody>
</table>

Table 5