



Bead Diagnostic Instrument (BDI)



Operating Manual

Issue 3(b)

www.controlpoint.co.uk

INTRODUCTION

The BDI is a piece of test equipment used to perform a quality test on the bead from butt-fused pipe joints. Removing and testing the bead created during butt fusion has been shown to have a strong correlation to defects within the joint itself.

The BDI can be operated in two modes, either as a stand-alone unit to give an indication of bead condition, or in conjunction with a smartphone to provide a permanent logged record of the bead test. The latter allows full traceability and analysis.

CONTENTS

Introduction	2
Contents	2
1 Safety instructions	3
2 Scope of operation	3
3 Preparing the unit for use.....	3
4 Library of Critical Components	4
5 Operating Procedure	5
6 Maintenance and Fault Finding.....	6
7 Power Management	8
8 Charging Battery	8
9 Specification	9
10 SmartPhone App.....	10

1 SAFETY INSTRUCTIONS

These operating instructions must be followed to ensure safe operation of the BDI unit. The user should be fully conversant with the safety instructions below before using the unit for the first time.

Prior to use, check that there is no obvious damage to the casing or any mechanical components.

The unit should be fixed firmly to a flat, stable surface such as a workbench or 'Workmate' type stand. It is recommended that either M10 bolts or suitable G-clamps are used to secure the device in place during operation.

Ensure there are no obstructions around the device and that the crank handle can be operated freely without risk of injury to the user. There should also be space to the rear of the machine for the tested bead to exit.

When charging the device only use a USB charger which is undamaged, meets local electrical requirements and, where appropriate, has a safety test certificate which is in date. Ensure the cable cannot become entangled within the mechanism, is not trapped and that the cable and socket are also undamaged.

2 SCOPE OF OPERATION

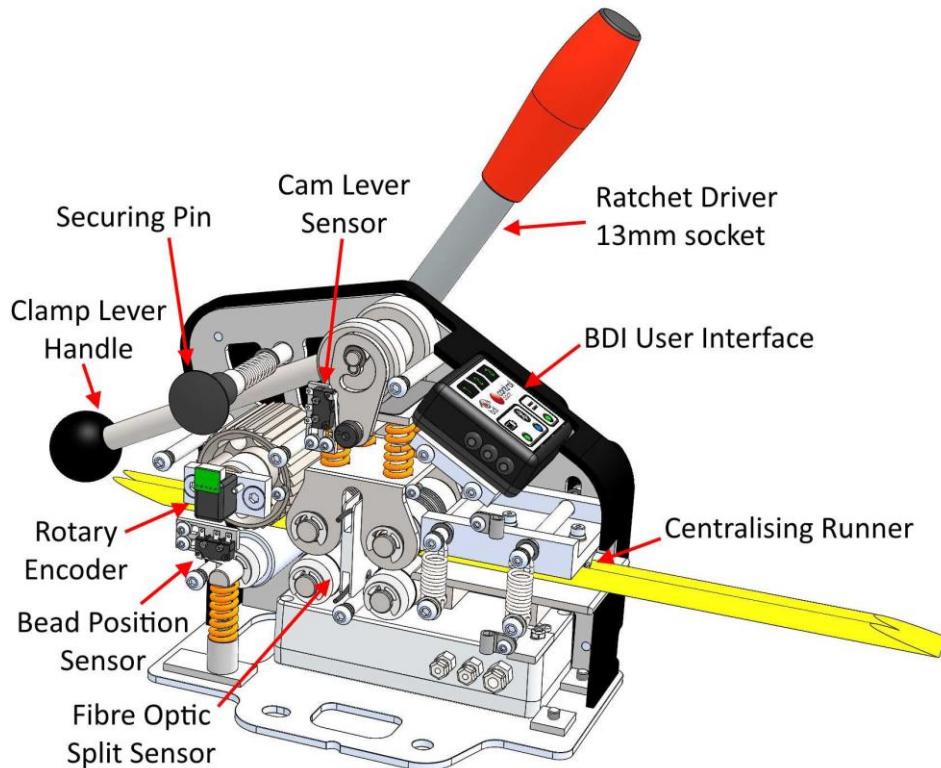
This equipment is designed specifically for the purpose of testing external beads from butt fusion joints of polyethylene pipes and should not be utilised for any other operation.

3 PREPARING THE UNIT FOR USE

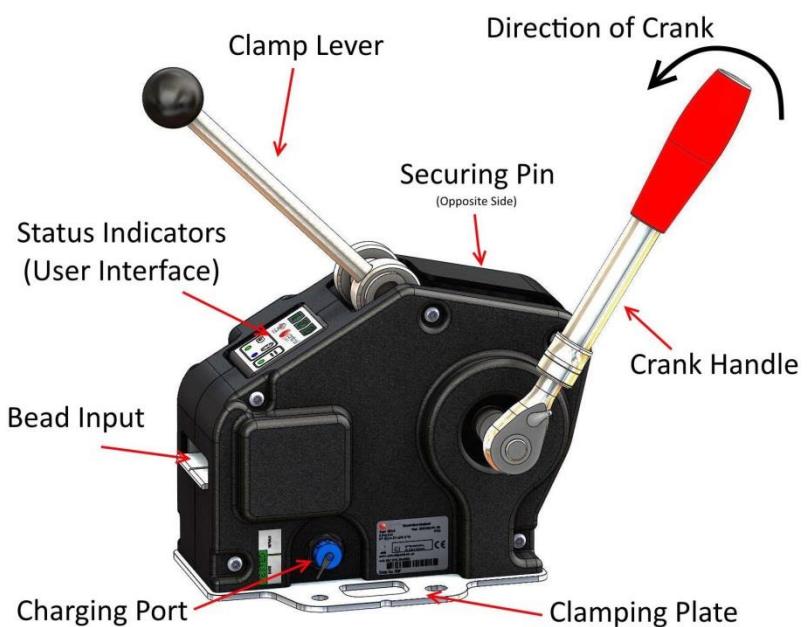
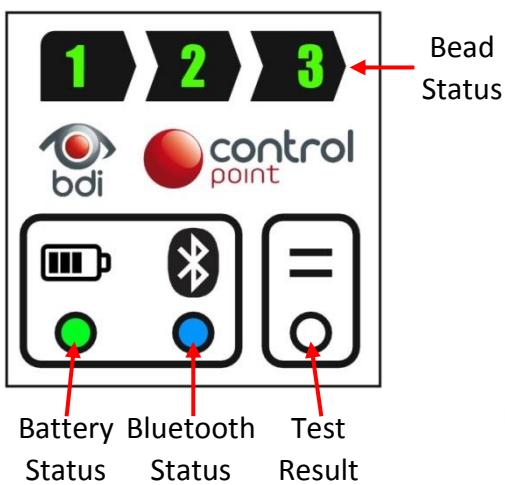
To power up the unit, move the clamp lever fully from one position to the other. After a short period the lights on the front of the unit will illuminate and the unit will perform a self-test.

If the unit does not wake, try connecting the charger as the battery may be flat. If any red lights are displayed, refer to the Fault Finding and Maintenance section.

4 LIBRARY OF CRITICAL COMPONENTS



BDI User Interface Detail



5 OPERATING PROCEDURE

Note: If you wish to log your bead test results to JointManager you must initialise your bead using the SmartPhone app prior to following the below instructions. Please see the [SmartPhone App](#) section for operating instructions.

1



Insert bead into the front of the machine ensuring the ridge side of the bead is facing upwards.

Make sure the blade runs in the valley of the bead to help centralization through machine.

2



Push the bead through the machine until you reach the back ratchet. Light 1 will turn green – it may be necessary to use the crank handle to pull the bead between the rear rollers before this happens.

Slowly advance the bead through the machine until the second light turns green. This indicates enough bead has passed between the rollers to ensure the drive will grip. Note that if light two does not go green the lever can still be engaged – refer to Fault Finding should this happen.

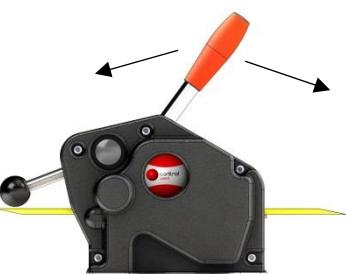
3



Engage the lever to apply the splitting force to the bead. All three lights should now flash green to indicate the unit is ready to test.

Ensure the lever is in its lowest position. Once in place secure the lever with the securing pin.

4



Ratchet the bead completely through the machine. In order to maintain a consistent evaluation, it is recommended that the ratchet process is undertaken as a steady, consistent speed.

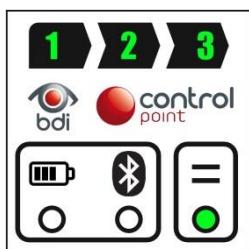
The results light will either show green or red.

Release lever back to the upright position to complete test. This will clear the result indicator – lowering the lever again before the next bead is inserted will recall the last result.

BDI Operating Manual

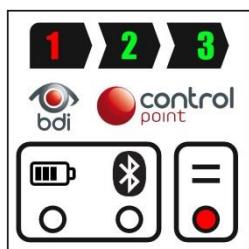
Should the drive wheel fail to grip the bead during the testing process the lever can be raised and the bead advanced a short distance before the lever is lowered again. Note that excess bead movement with the lever up will result in a test failure as the bead is not being tested for splits.

Once the test is complete, the unit will display a pass / fail indication on the Result Light and will display further failure information on the Bead Status Lights, if appropriate. Note that if a failure is detected during testing this will be indicated immediately.



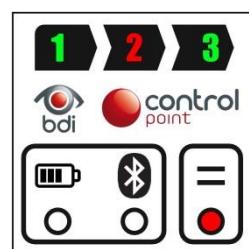
Test passed.

No splits or problems encountered.



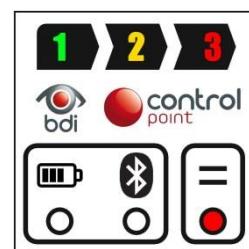
Test failed.

A split in the bead was detected.



Test failed.

An error in the test procedure was detected



Test failed.

A hardware fault was detected with the BDI.

Multiple failure modes may be present in a test so more than one status light may show red.

There are a number of test procedure errors which may occur. These are cases where actions performed by the operator has led to the test not being performed correctly, or has limited the amount of bead which is tested for splits. More detail is available via the Joint Manager record for the bead in question.

A hardware fault would typically indicate the unit requires repair. Any splits detected during the testing process are still valid, however the validity of a passed test cannot be confirmed so alternative testing should take place to ensure the joint integrity. The BDI unit should also be returned to the supplier for attention.

6 MAINTENANCE AND FAULT FINDING

The BDI does not have any user-serviceable parts. It should not be operated with any covers removed. If the unit is damaged in any way or does not operate correctly it should be returned to the supplier for prompt attention.

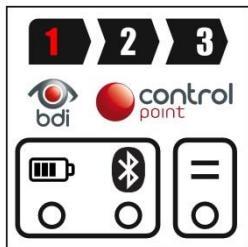
It is recommended that the unit internals be periodically cleaned of debris using a compressed air spray. Do not use an air line or any spray which may contain oil or solvents. Do not insert any tools inside the machine, especially tools with sharp or abrasive edges.

Do not immerse the BDI in water or spray it with any liquids. If the case needs cleaning, use a soft, damp cloth only.

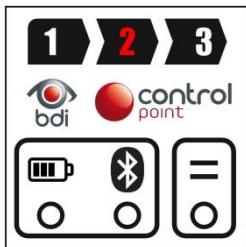
If any of the bead status lights are flashing red this means the BDI has detected a problem or encountered an unexpected condition which needs attention.

BDI Operating Manual

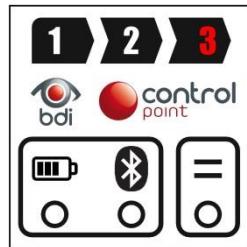
When initially powering up, and when the unit is reset by lifting the lever at the end of a bead test, a self-test is performed. This tests the sensors on the machine and verifies the internal configuration data to ensure there are no problems which require attention. If a problem is found then the bead status lights will show the following indications:



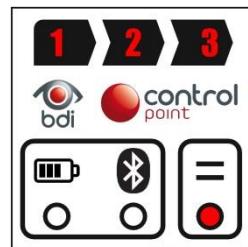
Fault with Bead Detection Sensor



Fault with Split Detection Sensor



Fault with Clamp Position Sensor



Internal Machine Check Failed

As a general rule, if a bead has been inserted before the unit is powered up then this will trigger warnings as the insertion process has not been monitored. The bead should be removed with the lever raised and inserted again.

Follow the instructions below to attempt to recover the fault, otherwise if the fault persists return the unit to your supplier for attention. Please note that there may be more than one fault indication present at any one time.

Status Light 1 Red – A bead has been detected at the rear roller. If there is a bead in the machine, remove it. Check to see if the back axel is stuck down and release if possible.

Status Light 2 Red – The unit was unable to verify the operation of the split sensor. If there is a bead in the machine, remove it. Clear swarf from the inside of the machine using a compressed air spray.

Status Light 3 Red – The lever is not in the expected position. Lift or lower as appropriate.

1,2,3 and Result Red – An internal check failed which means the unit configuration may have become corrupted. The unit must be returned to the supplier for service.

Should light 2 not change green during the bead insertion process this would indicate a fault with the Rotary Encoder. In this case, the lever can still be lowered and the bead tested for splits. However, the BDI will not pass a bead where this sensor is faulty, instead reporting a hardware fault. Should this problem occur then the unit must be returned for repair.

7 POWER MANAGEMENT

To maximise battery life, the unit employs power management software. The unit does not have a power switch, instead it will automatically power down if not used for a period of 10 minutes. To wake the unit, simply move the cam lever from one position to the other. The unit should wake and the appropriate status lights will illuminate.

The unit will not sleep if a bead test is in progress so care must be taken to ensure no bead is left in the machine as this will cause the battery to go flat much quicker.

When the battery voltage drops below a certain level the power LED will start to flash orange. This indicates that the charger should be connected, although there is still enough power to carry on testing a number of beads if mains power is not readily available.

When the battery gets critically low the LED will start to flash red. Once this happens the unit will prevent the Smartphone app from issuing new beads to the unit and the circuitry will not function if a new bead is inserted. Note that there is no physical block on passing a bead through the unit, however the test will not be electronically monitored.

When the unit sleeps, any Bluetooth connection to a Smartphone will be disconnected. You will be prompted to reconnect when the unit wakes again. When the battery is very low the phone may struggle to make a connection – if this is the case then connect the charger.

8 CHARGING BATTERY

The unit is charged from a USB port, either via a dedicated charger, a USB socket on a PC or a dedicated 5V charging supply (i.e. car AUX port/cigarette lighter with USB output). Never connect a supply higher than 5V to the unit. Connect the supply to the port on the side by first unscrewing the splash proof cap.

The battery requires charging for at least 6 hours when the battery is totally discharged. The power LED will turn amber while charging and will flash green once full.

If the power LED flashes amber then the charger should be connected, although the unit can still be used for a short period if the charger is not available. If the power LED flashes red then no further bead testing can be performed and the charger should be connected immediately.

9 SPECIFICATION

Charger		
Charge Voltage	5V nominal, 4.5 to 6.0V maximum	
Charge Current	Typical 0.5A	
Bead	Minimum	Maximum
Bead size - width	9mm	44mm
Bead size - height	4mm	12mm
Pipe Size (SDR11)*	125mm	630mm
Pipe Size (SDR17)*	180mm	1000mm
Bead Length	300mm	-
Environmental		
Operating Temperature	-10°C to +40°C	
Storage Temperature	-15°C to +45°C	
Weight	8.5kg Net	
Dimensions	H = 21cm	W = 21cm
		D= 34cm

* Illustrative pipe diameter and SDR only, confirm the bead is within recommended dimensions before inserting. The welding standard used and ambient conditions can affect final bead size.

10 SMARTPHONE APP

In addition to the normal mode of operation, the BDI can be used in conjunction with a smartphone app to record a detailed log of the bead test. This data can be transmitted to the JointManager website for further analysis. JointManager also allows test results to be accessed remotely at any time to validate a pipe installation.

The app is available on Android via the Play Store, iOS via the Apple Store and for Windows Mobile via the Windows Marketplace. The following QR codes can be used with a scanning app to locate the appropriate version for your phone.



BDI App for Android



BDI App for iOS



BDI App for Windows

10.1 LAUNCHING THE BDI APP FOR THE FIRST TIME



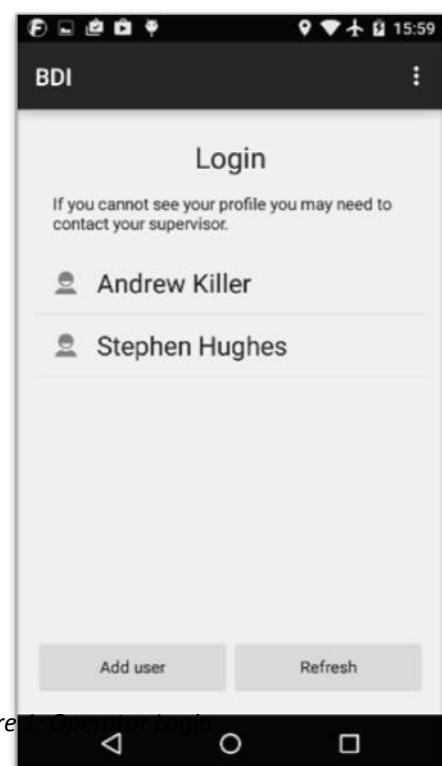
BDI

Once installed, the BDI app will be available from your phone apps screen. Locate the BDI application within the list of apps installed on your smartphone and touch to open it. The app icon is shown for reference.

On launching the application you will be presented with the operator logon screen. (Figure 1)

This screen shows a list of operators who have been set-up previously on this smartphone. On the initial launch of the application this list will be blank and you will need to first add a new operator by selecting the *add user* button. Once your operator profile has been added to the smartphone simply touch on it to begin the login process.

If you are unsure then you should contact the distributor/reseller of the BDI for further advice.



Figure

BDI Operating Manual

10.1.1 Add new operator

The add operator section allows new operators to be registered to the smartphone. You will be presented with a login dialog and will be asked to input a few details (Figure 2).

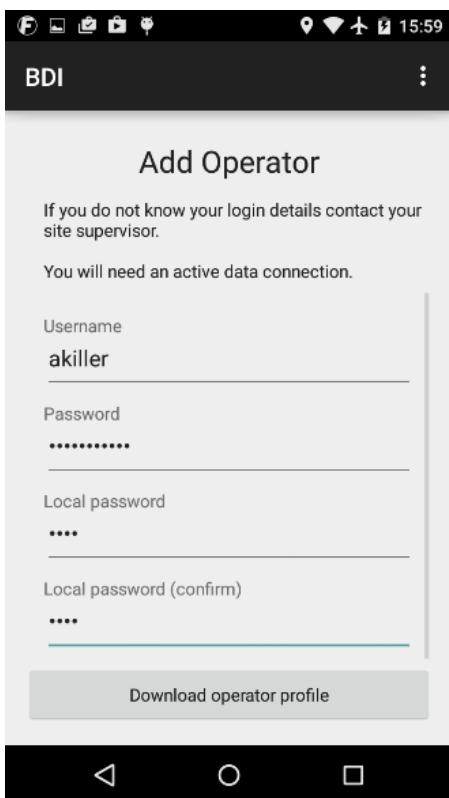


Figure 2: Add operator section

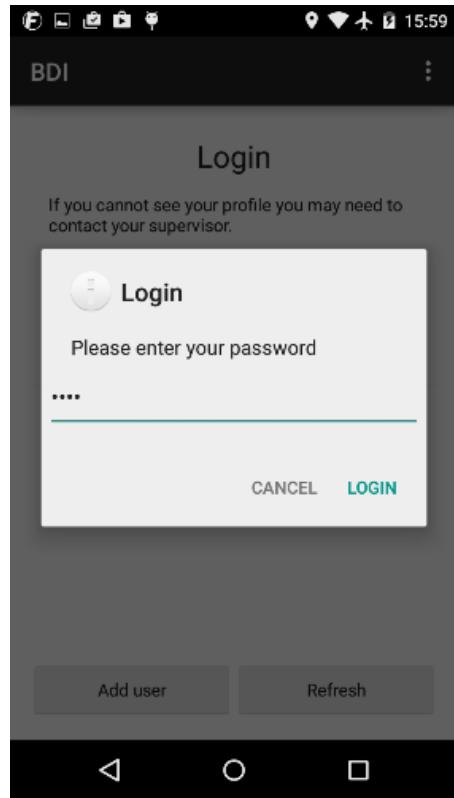


Figure 3: Entering operator login local password

The Username and Password are issued by ControlPoint and provide a link to JointManager. If the operator does not currently have a JointManager account or if it is not linked to the BDI then it will be necessary to contact ControlPoint to obtain a username and password.

The local password is used whenever the user logs in to the app. Typically this would be a short PIN code and can be set as desired. If setting up a phone on behalf of an operator (e.g. you are a supervisor) it may be preferred to only give the user their local password. This will prevent them from adding their operator profile to another phone without your knowledge.

Select *download operator profile* to have the app download the operator's profile information from JointManager. An internet connection is required at this stage.

10.1.2 Remove operator

To remove an operator long-press on the operator's name on the login screen then select *remove* from the menu.

10.1.3 Login

Once an operator has been added to the app they are free to login. You do not require an internet connection to login once set-up. To login as an operator touch the operator's name from the list of available operators. You will be prompted to enter your local password – see Figure 3.

Select the *login* button. If you enter an incorrect password you will be notified as such. If you enter the correct password you will be prompted to select a profile. This ensures the test results generated will be stored against the correct account in JointManager.

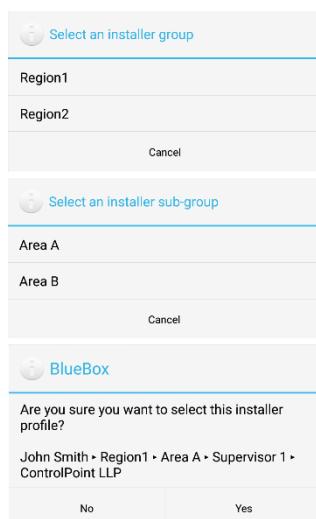
BDI Operating Manual

Many users will only have one installer profile available to select, in which you will be asked to confirm it is correct. Press the *Yes* button if this is true. If incorrect contact ControlPoint to add the relevant profile to your account.

Your installer profile may have been set-up with a group, sub-group and supervisor structure. You will be asked to select the applicable values for the bead you are currently testing.

In the example, the installer is able to select two regions. Having chosen *Region 1* they are able to then select from two areas. Selecting *Area A* they confirm they are working for *Supervisor 1* for ControlPoint.

After a profile has been selected you will be taken to the [connect to BDI](#) section.



10.2 CONNECT TO BDI

The select device section displays a list of previously paired BDI devices. A green tick designates that the device is powered on, within range, and available for connection. A green tick will not be displayed if another device is presently connected to the unit. If launching the application for the first time this list will be empty and you will need to first [pair to a new device](#). If the device you wish to connect is already paired then you may continue to [connect to the device](#).

10.2.1 Pair to new device

To pair to a new device select the *pair* button on the select device section. This will open the smartphone's native Bluetooth pair dialog. Please refer to your smartphone manufacturer's instructions for how to add a new device. In general, a list of available (within range, and not currently connected to anything else) Bluetooth devices will be presented. To connect to a desired device touch on its name. You may be asked for a PIN code to connect, in which case it is usually 1234.

When pairing has been completed with the device press the back button on your phone (◀) to return to the select device section.

10.2.2 Connect to device

To connect to a BDI device which has already been paired locate it in the list of BDI devices and touch on it. A dialog will be shown onscreen whilst the app attempts to connect to the device and perform basic initiation (Figure).

If the app successfully connects to the BDI device it will continue to the [initialise job](#) section. If the connection fails try again; if subsequent attempts also fail then try restarting the smartphone.

Note for iPhone users:

To connect to the BDI when using an iPhone you must pair and also connect in the phone settings.

BDI Operating Manual

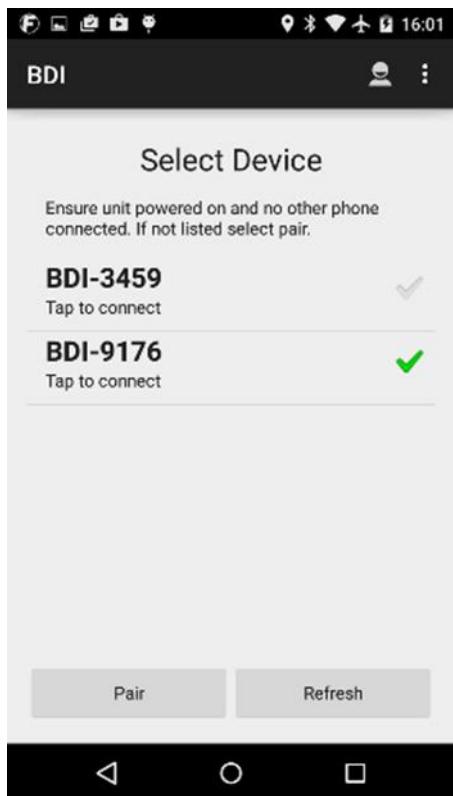


Figure 4: Select device section

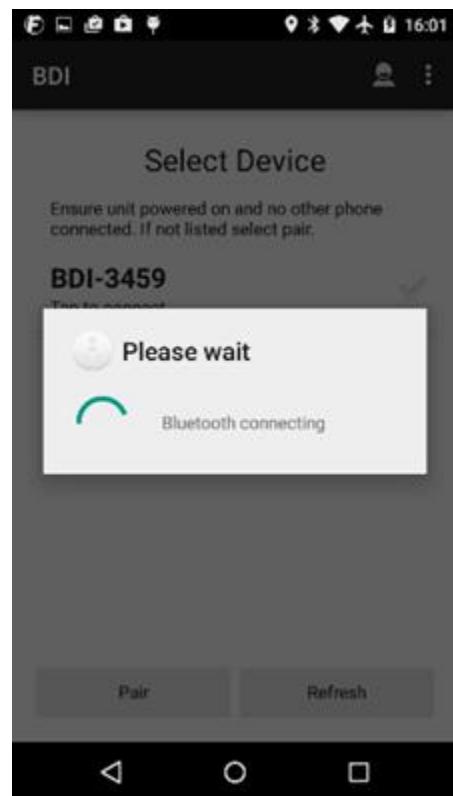


Figure 5: Connecting to BDI device

BDI Operating Manual

10.3 INITIALISE JOB

Prior to testing a bead the app must be initialised. This involves entering basic project and bead details and taking a pre-test photo (if required).

10.3.1 Enter job details

The job details' section allows for details of the current job to be saved against the bead record data.

This information is captured and displayed on JointManager and allows for all work carried out under a particular project for example to be analysed.

All of this information is optional but filling it in will help in tying a particular BDI test to a Butt Fusion weld.

10.3.2 Enter bead details

The bead details' section allows for details of the bead and its associated weld to be saved against the bead record data.

These details are used to help associate the bead test with a butt fusion record and also to perform additional validation which is not possible with in the BDI unit itself.

To change any of the parameters simply touch on the desired parameter. For example, touching on *material* opens the material selection dialog:

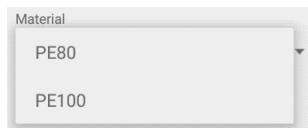


Figure 7: Material parameter selection

You may enter the butt fusion machine serial number manually or by scanning a barcode containing the serial number. To scan using a barcode click the barcode icon:

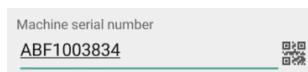


Figure 9: Capture barcode button

This will open the barcode capture window. Place the barcode inside the viewfinder rectangle as instructed and wait for it to scan. You may need to adjust your phone position as necessary to ensure the camera is able to sufficiently focus. If capturing a 1D ("zebra" pattern) barcode ensure the smartphone is rotated to landscape orientation, as demonstrated in figure 11:



Figure 10: Barcode scan (QR)



Figure 11: Barcode scan (1D)

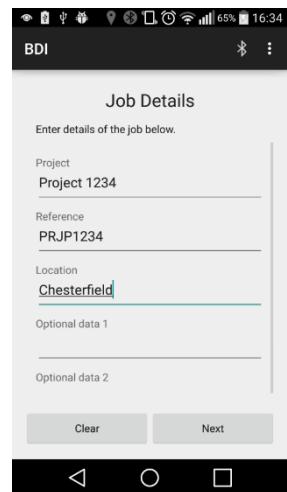


Figure 6: Job details' section

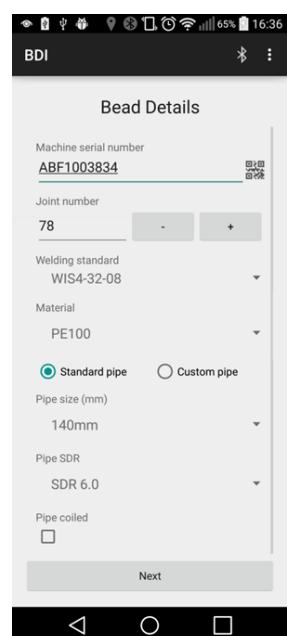


Figure 8: Bead details entry

BDI Operating Manual

Custom pipe sizes may be manually input using the *custom pipe* radio selection and typing the appropriate size and wall thickness in to the fields.

Once all bead parameters have been entered select the *next* button to [issue the bead](#).

10.3.3 Issue bead

The app will now issue the bead to the BDI device. This process may take a few seconds to complete.

When completed you will be taken to the pre-test photo section.

10.3.3.1 Take pre-test photo

If you wish you may take a photo prior to beginning the bead test process.

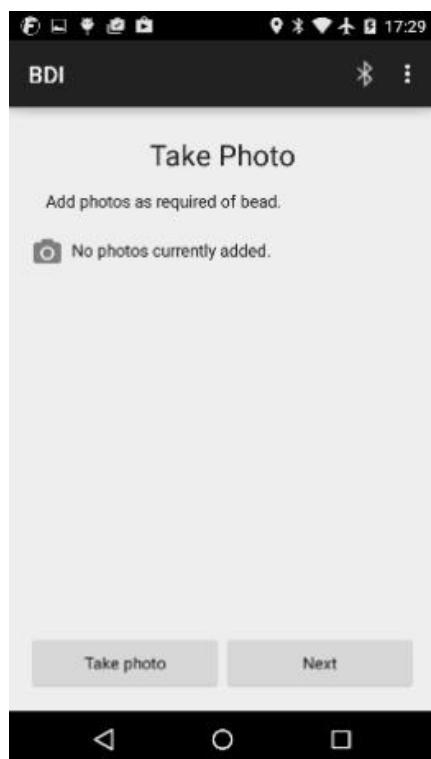


Figure 14: Take pre-bead photo

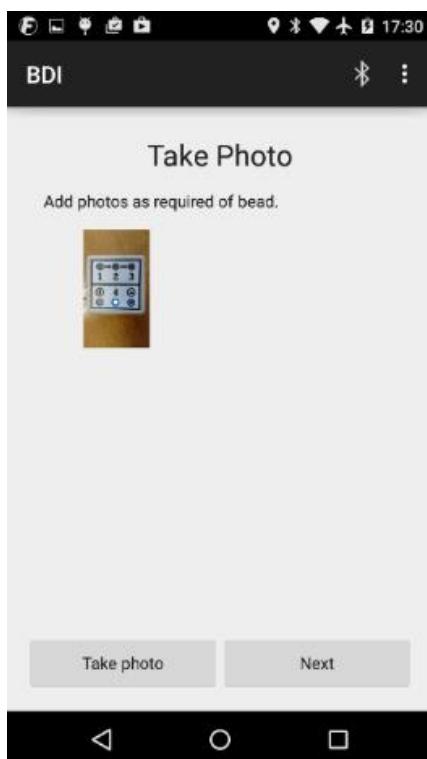


Figure 15: Photo added to gallery

To take a photo select the *take photo* button. Your smartphone's native camera application will launch; please refer to the manufacturer's manual for guidance. In general, simply use the camera application to take a photo then confirm you are happy with it, usually by touching a confirmation button (an *OK* button or tick image). When a photo has been taken and confirmed the BDI app will resume and the photo added to the gallery.

Additional photos can be added at this point if necessary. To continue after all desired photos have been taken select *next*. You may now [perform the bead test](#).

10.4 PERFORM BEAD TEST

At this point in the process the BDI app will display a live data screen of data from the BDI device. If you wish to take a photo during any point of the testing process select the *take photo* button; the process is the same

<input type="radio"/> Standard pipe	<input checked="" type="radio"/> Custom pipe
Pipe size (mm)	
63	
Wall thickness (mm)	
10.50	

Please wait

Issuing bead

Figure 12: Pipe parameter details

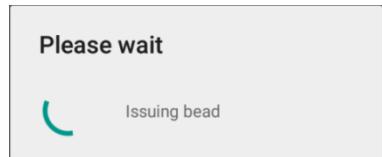


Figure 13: Bead being issued

BDI Operating Manual

as per taking a [pre-test photo](#). Otherwise, the phone may be put aside and the screen turned off whilst you complete the bead test as per the [operating procedure](#) section.

10.5 COMPLETE BEAD TEST

If the app has been closed you must launch it again and re-connect to the BDI device (if prompted) for this detection to be made. Once a bead test has been completed the BDI app will automatically detect this and give the option to the operator to select whether they agree or disagree on the result given by the BDI machine. The list of options will change depending on whether the BDI detected a failed bead or not

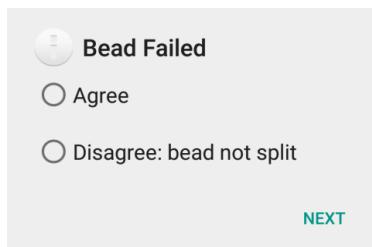


Figure 17: Operator confirmation

Next, a post-test photo can be taken; the process is the same as per taking a [pre-test photo](#).

It is important you reconnect using the same smartphone that the bead was issued on.

Once all required photos have been taken the BDI app will communicate with the BDI device to download the bead test data. This process should take no longer than a few seconds.

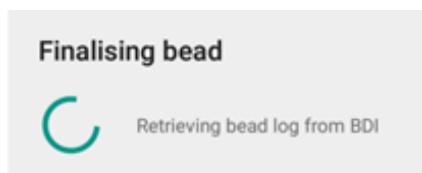


Figure 18: Downloading bead data

Finally the app will confirm that the bead has been saved and is awaiting upload to JointManager.

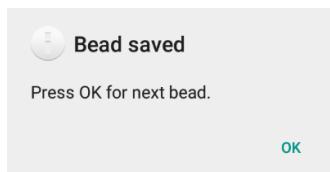


Figure 19: Bead data saved, awaiting upload

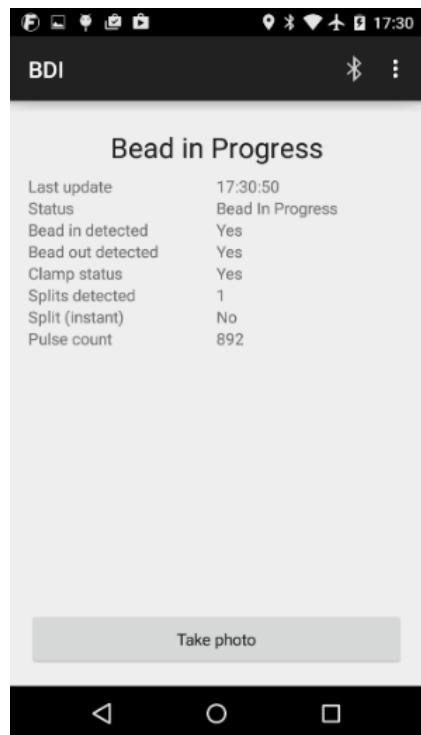


Figure 16: Bead in progress

BDI Operating Manual

10.6 CHECK JOINTMANAGER UPLOAD PROGRESS

Once a bead test has been saved then subject to an internet connection being available it will be uploaded to JointManager momentarily without any intervention from the user. If an internet connection is unavailable BDI will simply store pending beads until such a time occurs where an internet connection is available. The amount of pending beads which may be stored is only limited by the amount of storage space the smartphone has available; it is generally expected the amount of free space will far exceed the number of pending joints that will ever be accrued. A bead test with a single photo will only require around 1 megabyte of storage space. To view the status of pending uploads open the smartphone's notification bar. In general, this is achieved by sliding your finger down from the top of the smartphone's screen until the notification screen appears:

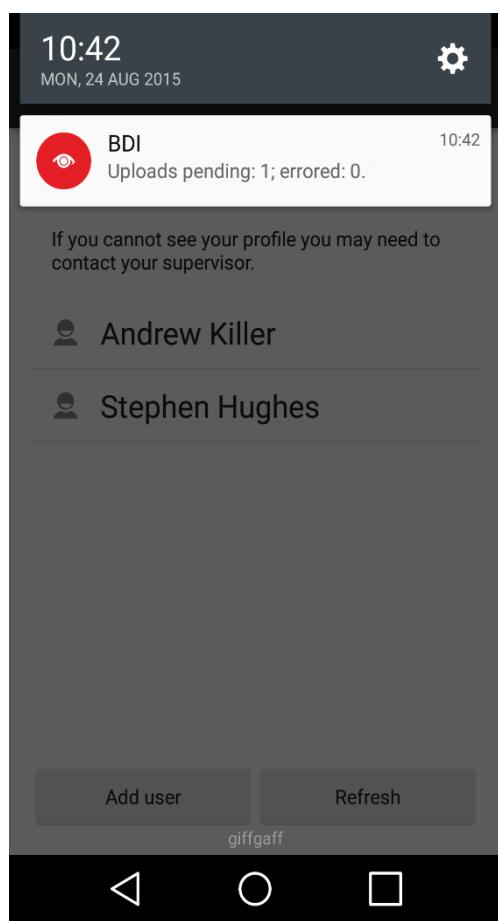


Figure 20: BDI upload notification

In the above example, one pending upload has not yet been transferred to JointManager. It is important to regularly check to ensure bead test results are being transferred to JointManager successfully. Once a bead test has been completed it may take a few seconds before the notification bar is updated to show that is a pending upload, or if a good internet connection is available the bead test may have been uploaded before you get chance to open the notification bar.

Please check the JointManager website for final confirmation of data uploads.

Note for iPhone users:

BDI Operating Manual

On the iPhone, the BDI app will only try to upload data for up to 10 minutes after the app has been closed. Pending uploads can be found in the file browser which can be accessed from the menu. If you know you have files to upload then open the BDI app once you are in a good signal area and wait until all the files have been uploaded.

Note for Windows users:

To check the upload progress of the BDI open the app then go to the menu and open the file browser. Anything in the 'Pending' folder is awaiting to be uploaded.

BDI Operating Manual



ControlPoint

ControlPoint House
Carrwood Road
Chesterfield
Derbyshire
S41 9QB

Email: info@controlpoint.co.uk
Web: www.controlpoint.co.uk