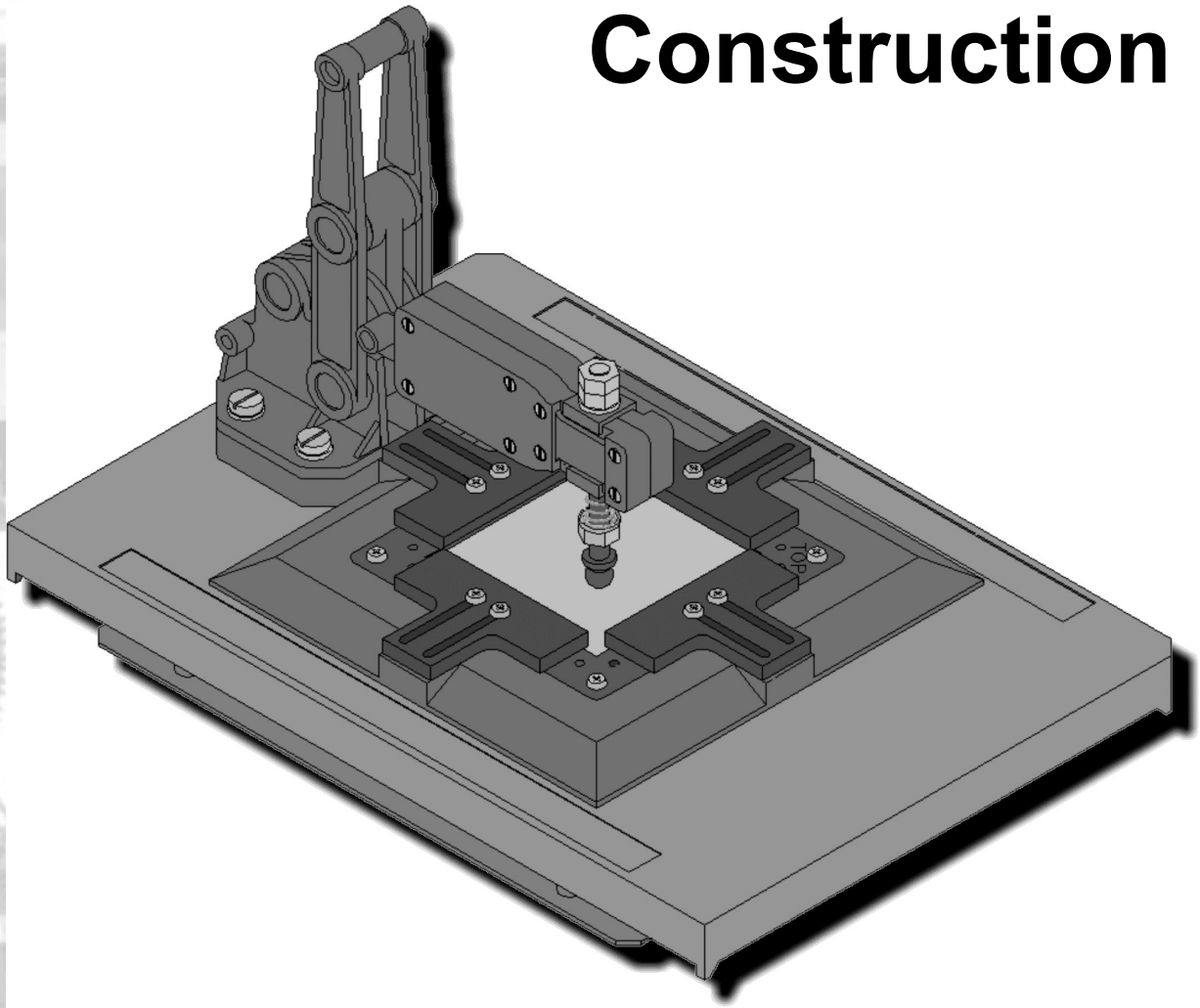
AT Series Transformer Testers

Guide To Fixture Construction



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Guide To Fixture Construction

VPN: 98-028/3

The contents of this manual are believed to be accurate at the time of printing. Voltech reserves the right, however, to change the specification of the fixture system without notice. No liability is accepted for the inappropriate, negligent, or incorrect set-up of the fixture by the user via either manual or automated means.

HEALTH AND SAFETY

Only persons trained in the equipment, tools and materials they use should construct fixtures, and then only after reading and understanding this construction guide.

All local regulations concerning the safety of machinery and chemical storage and use must be adhered to (especially, but not exclusively, the guarding of rotating machinery and the wearing of safety equipment including goggles).

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1. INTRODUCTION

The Voltech series of AT Automatic transformer testers are able to perform a comprehensive series of tests on a wide variety of transformers. To utilize this capability fully it is recommended that test fixtures are constructed to suit each particular type of transformer to be tested.

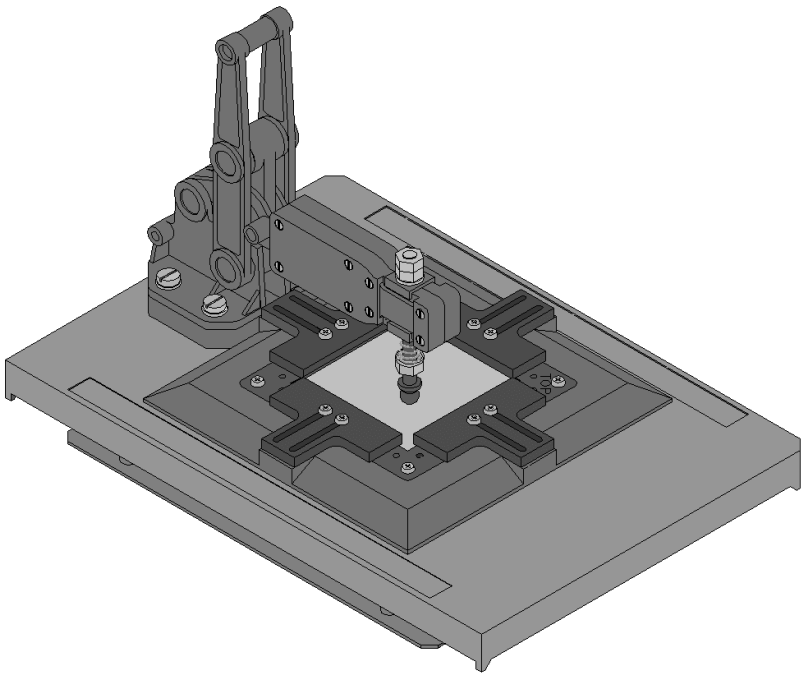


Figure 1

Test fixtures provide the interface to the transformer tester via the tester node pins, allowing transformers to be quickly inserted and removed in a reliable manner taking full advantage of the high speed testing capability of the tester.

Test fixtures are not difficult to construct, and good test fixtures will minimize operator fatigue, ensure optimum repeatability, prevent unnecessary rejects and increase throughput of the transformer tester.

This guide provides advice on the construction of test fixtures for a number of different transformer styles.

A range of pre-drilled components, probes and clips are available from Voltech.

You can also make use of the free area behind the fixture, allowing you to mount other clamps, handling accessories, ink jet spray printers or even a scanning bar code reader close to the point of test.

2. PRINCIPLES OF KELVIN CONNECTIONS

In testing many transformer parameters, such as winding resistance or inductance, it is necessary to measure an electrical impedance.

The normal method of measuring impedance is to pass a test current through the unknown component, and to measure the resulting voltage produced across it. Dividing the voltage by the current gives the required value of impedance.

In making such measurements, great care must be taken not to include the impedance of the measuring leads in the result. A connection system which avoids such problems is shown in figure 2; it uses four wires and is often referred to as a Kelvin connection.

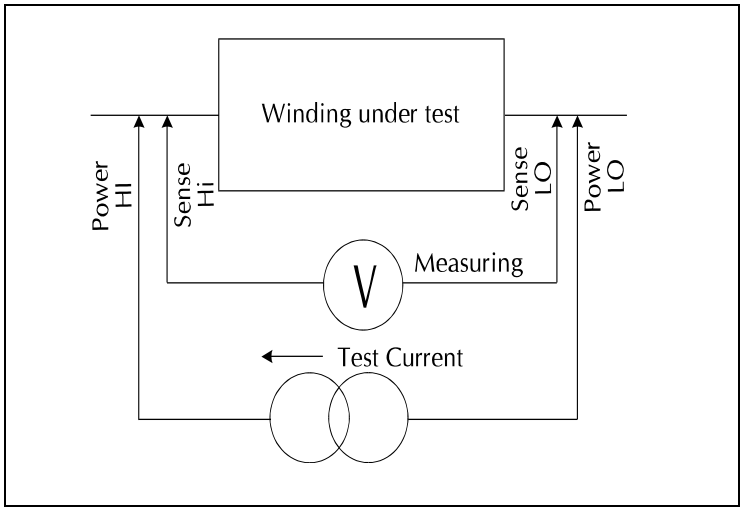


Figure 2

Measuring Impedance with Kelvin Connections

In this arrangement, the test current passes through the two "power" leads, and the voltage is measured using the two "sense" leads. Provided that the sense leads are connected as close as possible to the body of the device under test, any additional voltage drop produced by the test current flowing through the impedance of the power leads is not measured. The Kelvin connection therefore provides the most accurate means of sensing the voltage, and hence the impedance of the winding.

Ideally, all impedance measurements would be made using Kelvin connections. However, many terminals do not permit the use of four wires all the way to the body of the component under test. In such cases, separate power and sense leads are used up to the base of the terminal, and the length of "common" lead (from the junction of the power and sense leads, through the terminal and the component lead to the body of the component) should be kept to a minimum. The "common" lead length is shown as AA' and BB' in Figure 3.

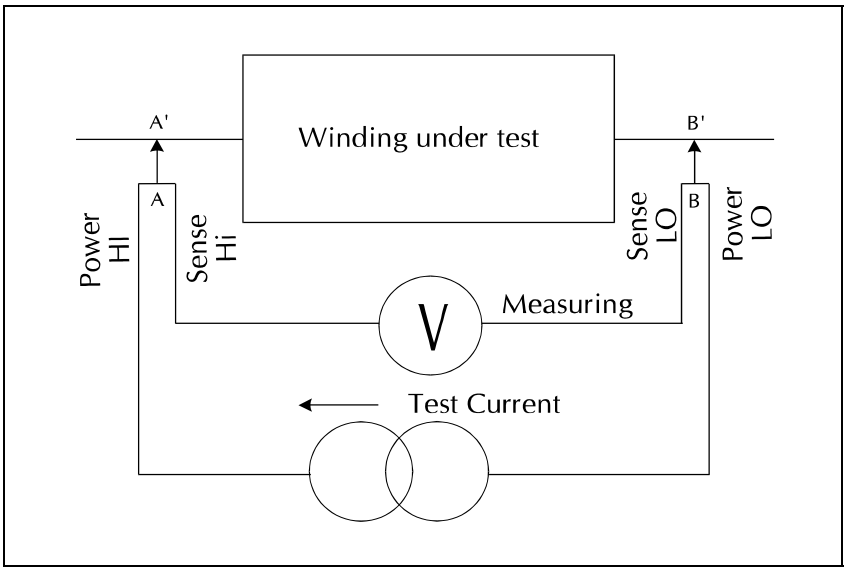


Figure 3

Kelvin four terminal connections are recommended for use with test fixtures for transformers whose winding impedances are less then 1 ohm.

The AT Series testers provide all the connections required to take advantage of Kelvin measurements.

A test node may be considered to be a pair of connections consisting of one power and one sense terminal. The following diagram indicates how to identify the node terminal function:

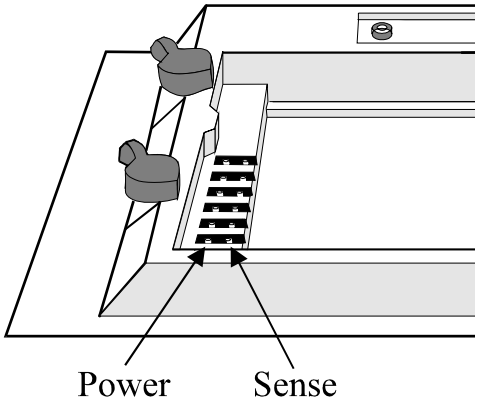


Figure 4

POWER terminals are all on the outside of the fixture area.

SENSE terminals are all on the inside of the fixture area.

IMPORTANT NOTE:

Kelvin four terminal connections are recommended for use in all test fixtures. To ensure the specified accuracy of any test, kelvin connections are essential when making a measurement on a winding impedance of less than 1Ω.

If in doubt, calculate the inductive impedance using:

$$Z = 2 \times \pi \times (\text{test frequency}) \times (\text{nominal inductance})$$

and consult the transformer designer if required.

For optimum accuracy at low impedance levels, AT Series Testers have no internal connection between power and sense. **THE POWER AND SENSE TERMINALS MUST BE LINKED ON THE FIXTURE AS IN FIGURE 2 (KELVIN CONNECTORS) OR AS IN FIGURE 3.**

3. APPLICATION AND SPECIFICATION

The fixture is designed to connect to wound components with the following characteristics:

Size:

A footprint of up to 63.5mm square

A height of up to 63.5mm

A connection matrix up to 60mm square

Connection Types:

Surface mount

Pin connection

Blade connection

Flying leads

Pitches of:

1.27mm

1.962mm (0.156”)

2.00mm

2.5mm

2.54mm (0.1”)

3.81mm (0.15”)

There are some application limitations to the above. For example, the minimum pitch of the blade type that can be connected to is determined by the minimum pitch that the necessary connector can be put on.

Also, although a 1.27mm pitch is available, it is only anticipated that component connections will be on multiples of this pitch and there will not be two connections only 1.27mm apart.

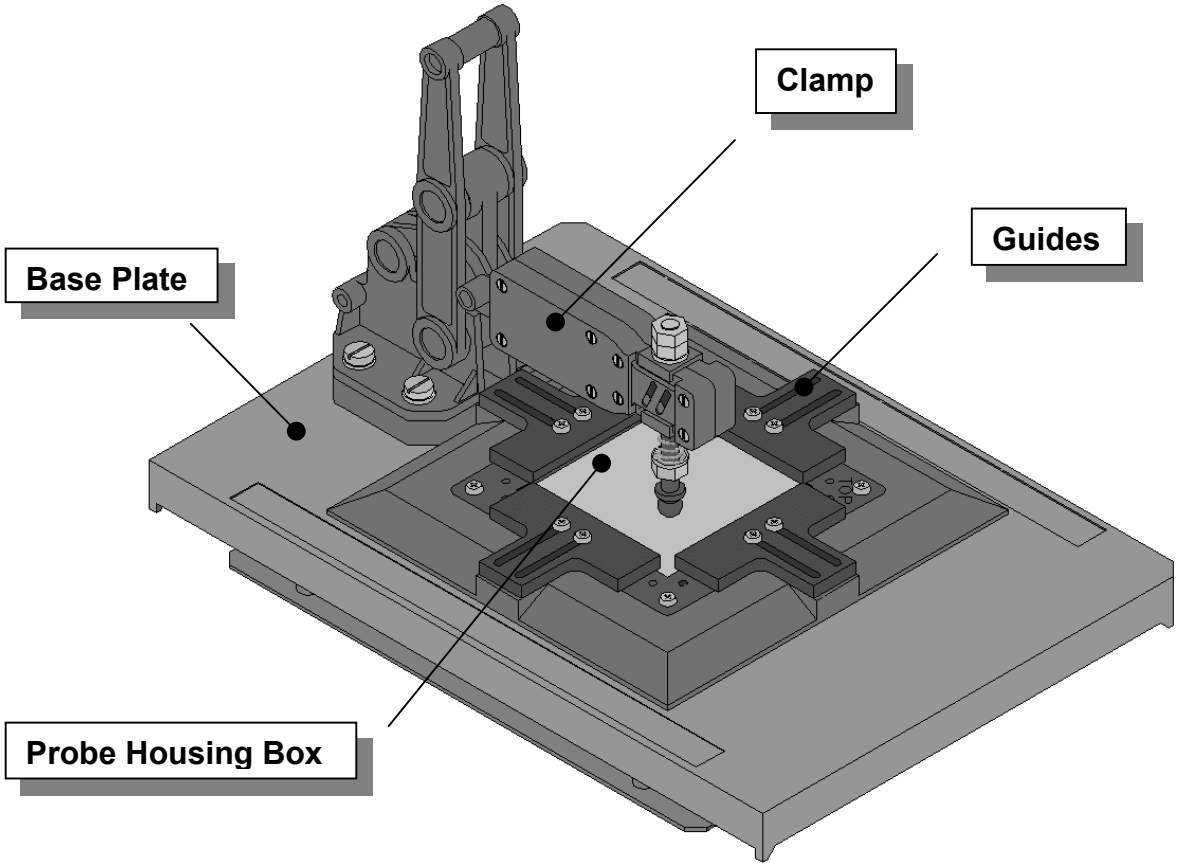
Compatible connection types:

- Kelvin clips
- Kelvin blades (Automech type)
- 4mm sockets
- ATE pin types
  - Rotary point
  - Castellated
  - Point
  - Cup
  - Crown

4. FIXTURE SYSTEM OVERVIEW

The Voltech AT Series fixture system allows you freedom and flexibility when considering your fixturing needs.

All fixtures are mounted on fixture boards, which are available as a blank fixture plate and also as fixture kit which contains parts to help you.



Base Plate

Already fitted with 20 pairs of contacts, the base plate fits into the top of the tester and makes electrical connection to the tester's 20 pairs of test nodes.

The base plate has molded indents and guides to ease the fitting and wiring of larger test sockets and posts for flying leads.

Probe Housing Box

This 9mm thick plate is designed especially to hold a wide range of ATE probes and kelvin blades.

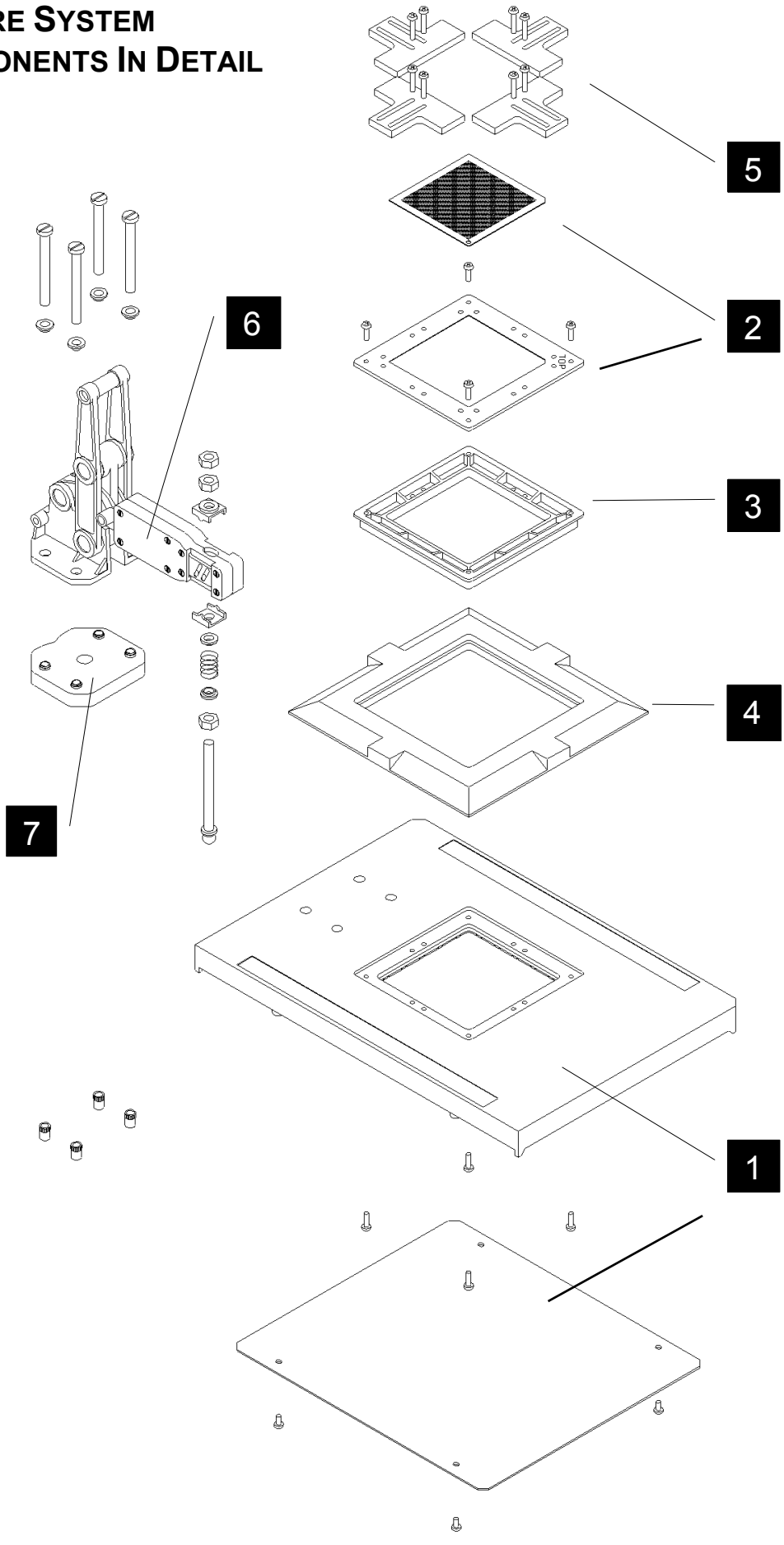
Clamp

An optional hand clamp holds the test piece against the test probes.
The clamp is adjustable in height and spring pressure.

Guides

Adjustable guides help to locate the test piece in the fixture quickly and accurately.

FIXTURE SYSTEM COMPONENTS IN DETAIL



1. Base Plate

This fits into the top of the transformer tester and has the following features:

- Fitted with 40 node contacts which connect to the 40 test node pins on the top of the tester.
- Moulded indents on the bottom surface to act as drill guide marks for ease of drilling to fit:

  4mm safety sockets
- Provision for drilling through and fitting inserts for the attachment of a clamp in either the left or right hand position.
- Slots moulded into the base to support wiring to the connection points from the nodes.
- Four mounting pillars to hold the cover plate (supplied). The cover plate is attached on to the underside of the fixture by four screws to protect the wiring from accidental damage.

The fixture parts are made using a high-pressure injection moulding process in a material that is suitable for soldering temperatures and the high voltage that will exist during use.

2. Interface Plate

The interface plate is a glass fibre board with an injected plastic trim and fits into the bezel in close alignment with the probe housing box. The interface plate supports the body of the test piece during testing.
The bezel has 4 groups of 2 x M3 inserts for the attachment of the Guides. The plate can accommodate a test piece of up to 63.5mm square, and can be drilled for probes over an area of 60mm square when using the drilling plates.

3. Probe Housing Box

The housing box fits into the bezel and base plate. This box has a base thickness of 9mm so that it can be drilled to accommodate a range of ATE probes and Kelvin blades.
The Housing box is fastened into position by 4 x M3 screws which also lock the Bezel into place.

4. Bezel

This provides an accurate location for the probe housing box and the test piece interface plate. The design also includes support areas for the rear of the guides.

5. Guides

The guides help to locate the test piece into the fixture quickly and accurately.

They are adjustable to suit the test piece plan size and can be stacked or reversed if required.

The guides are capable of having sections cut off to enable them to be used down to small footprints. Four are shown in the sketch.

6. Clamp

A clamping mechanism may be purchased to hold the test piece in place for testing.

The clamp head has a sliding guide which allows the vertical clamping rod to move horizontally relative to the clamp head. This minimises the possibility of side movement to the test piece during the clamping action.

The clamp head also incorporates adjustment for 10mm of height and spring pressure.

7. Height Blocks

Height adjustment blocks are capable of being stacked in order to clamp a test piece of up to 63.5mm in height in 10mm steps.

FIXTURE PARTS AVAILABLE FROM VOLTECH

A variety of items are available from Voltech in the form of the kits described below. Detailed descriptions follow.

ITEM	ORDER CODE
A Fixture Plate	**91-184**
For mounting existing fixtures	
B Custom Fixture Kit	**91-185**
For constructing you own custom fixtures.	
C 40 Socket Fixture	**91-186**
Ideal for prototyping work	
D Connection Lead Set	**78-030**
For use with the 40 Socket Fixture 91-186	
E Clamp Kit	**91-185**
For use with any Voltech fixture	
F Drilling Templates	
Re-usable tooling to aid drilling of the probe box and interface plate of the custom fixture kit.	
1.27mm (0.05”) Pitch Template	**50-038**
2.00mm Pitch Template	**50-309**
2.50mm Pitch Template	**50-310**
2.54mm (0.1”) Pitch Template	**50-311**
3.81mm (0.15”) Template	**50-312**
Pack of 5 (1 each of the above) Templates	**50-307**

ITEM	ORDER CODE
G Pre-Drilled Probe Box Kits	
Pre-drilled probe box and interface plate kits on a range of common bobbin pitches.	
2.54mm (0.1”) Drilled Probe Box Kit	**FSK 91-197**
5.08mm (0.2”) Drilled Probe BoxKit	**FSK 91-198**
3.81mm (0.15”) Drilled Probe Box Plate Kit	**FSK 91-199**
5.00mm Drilled Probe Box Kit	**FSK 91-200**
RM Core Drilled Probe Box Kit	**FSK 91-201**
H Probe Starter Kits	
A selection of spring probes, receptacles and wire for assembling the Pre-Drilled Probe Box Kits.	
Probe Starter Kit for 2.54mm (FSK 91-197)	**FSK 100-062**
Probe Starter Kit for 5.0, 5.08 and 3.81mm (FSK 91-200, FSK 91-198, FSK 91-199)	**FSK 100-061**
Probe Starter Kit for RM (FSK 91-201)	**FSK 100-063**
I Probe Replacement Kits	
A kit of spring probes only, intended for maintenance of fixtures manufactured using the above kits.	
Probe Replacement Kit for 2.54mm (FSK 91-197)	**FSK 54-212**
Probe Replacement Kit for 5.0, 5.08 and 3.81mm (FSK 91-200, FSK 91-198, FSK 91-199**)**	**FSK 54-210**
Probe Replacement Kit for RM (91-201)	**FSK 54-214**
J Kelvin Blades	
Pack of 10 Medium Kelvin Blades	**MEDIUM KELVIN KIT**

A. Fixture Plate

Designed for mounting existing fixtures to an AT series tester the fixture plate comprises:

- Item 1, Base plate (including contact pins) with cover.
- Item 2, Test piece interface plate.
- Fixings for above.

B. Custom Fixture Kit

A kit of parts for constructing your own fixtures. Interconnecting wire, test probes or clips and a drilling template will also be required. The custom fixture kit comprises:

- Item 1, Base plate (including contact pins) with cover.
- Item 2, Test piece interface plate.
- Item 3, Probe housing box.
- Item 4, Bezel.
- Item 5, Guides (12 off)
- Fixings for above.

C. 40 Socket Fixture

A fixture board fitted with 40 4mm sockets. 20 red (power) and 20 black (sense). The sockets are wired to the 40 contacts which align with the testers' 40 nodes.

This fixture may be used for convenient wiring to existing fixtures or as a means of connecting flying leads and clips for use in developing test programs or testing parts in a design laboratory.

D. Connection Lead Set

Intended for use with the 40 socket fixture, the connection lead set provides a versatile method of connecting to sample parts for prototyping and evaluation. Custom fixtures are always reccomended for production use.

The connection lead set comprises;

10 x Spring loaded connection posts

10 x Kelvin crocodile clip to 4mm plug leads.

10 x Non-Kelvin crocodile clip to 4mm plug leads.

10 x Fine non-Kelvin clip to 4mm leads.

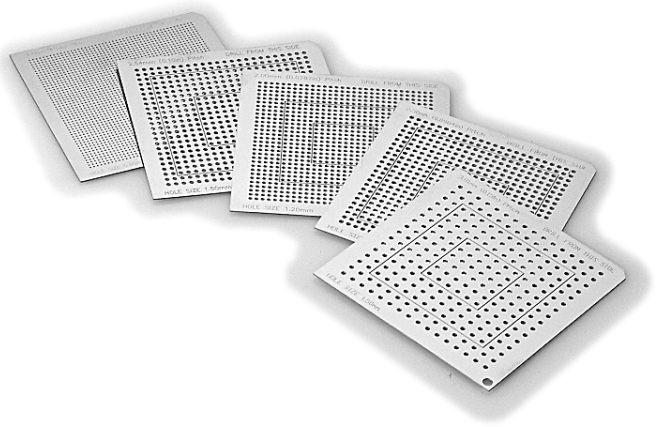
E. Clamp

The hand clamp is supplied with 7 height blocks and fixings.

F. Tooling

To enable the probe housing box and the test piece interface plate be drilled to the accuracy required, stainless steel drilling templates are available in the following grid pitches: -.

1.27mm
2.00mm
2.50mm
2.54mm
3.81mm

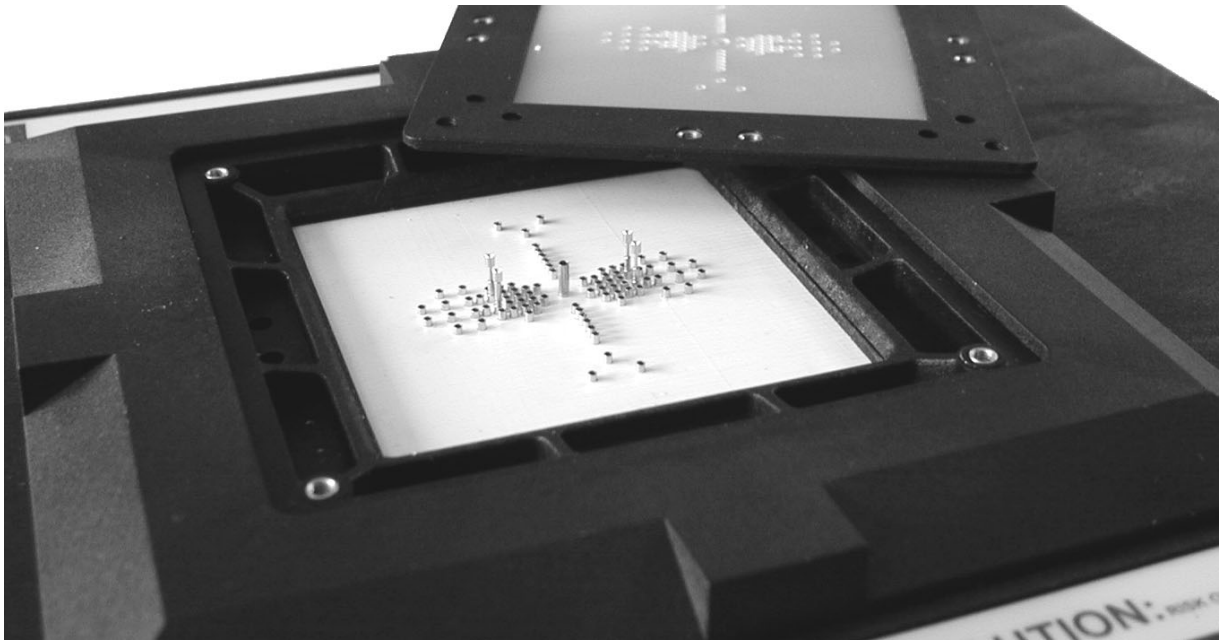


To hold the drilling templates in place for drilling, clips are provided to hold the drilling templates in place. They clip into holes provided at the corners of the interface plate and the probe housing box.

Tooling is not required if you intend to use a Voltech Drilled Box Kit.

G. Pre-Drilled Probe Box Kits

Instructions later in this manual guide you through the process of drilling probe housing boxes and interface plates to suit the bobbin pattern that you wish to test. A selection of probe housing boxes and interface plates are available pre-drilled to suit many common through –hole bobbin types.



Probe box and interface plate drilled for RM bobbin.
(Receptacles and probes supplied separately.)

Each probe box kit comprises:

- A probe housing box, already drilled to a particular pitch or pattern.
- An interface plate drilled to the same pattern.
- Fixings and spacers for use with a Voltech Custom Fixture Kit.

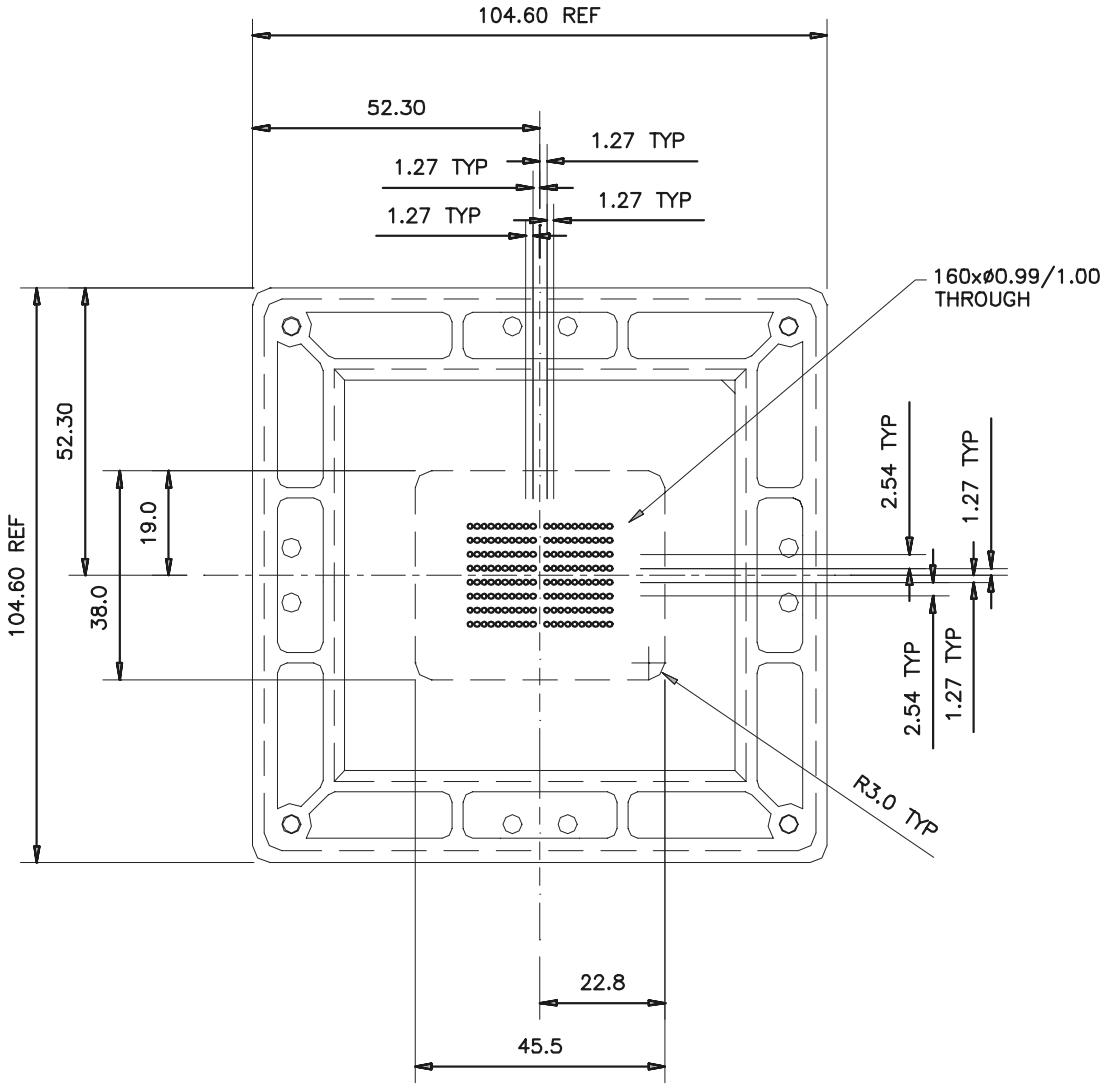
You will also need:

- A Voltech Custom Fixture Kit (VPN 91-185).
- Kelvin blades and/or spring probes and receptacles. (Voltech kits are available.)
- Interconnecting wire (supplied in the Voltech Starter Kits).
- A clamp to hold the transformer against spring probes.
- 4mm sockets and/or Kelvin clips for flying leads and tags.

See also the section ‘Choosing Connecting Probes, Kevin Pins and Clips’ if you are not familiar with any of the terminology used here.

2.54mm (0.1”) Probe Box Kit (Part No. FSK 91-187)

For surface mounting pads and through hole mounting round, rectangular or square pins.	
No. of pins	Up to 16 (8 each side)
Pin pitch	2.54 mm
Pitch between rows	2.54mm to 17.78mm in 1.27mm steps.
Pin length	0 to 3.2mm below the level where the transformer will rest on the PCB using Probe Kit B.
Pin diameter	up to 0.35mm



Drilling details:

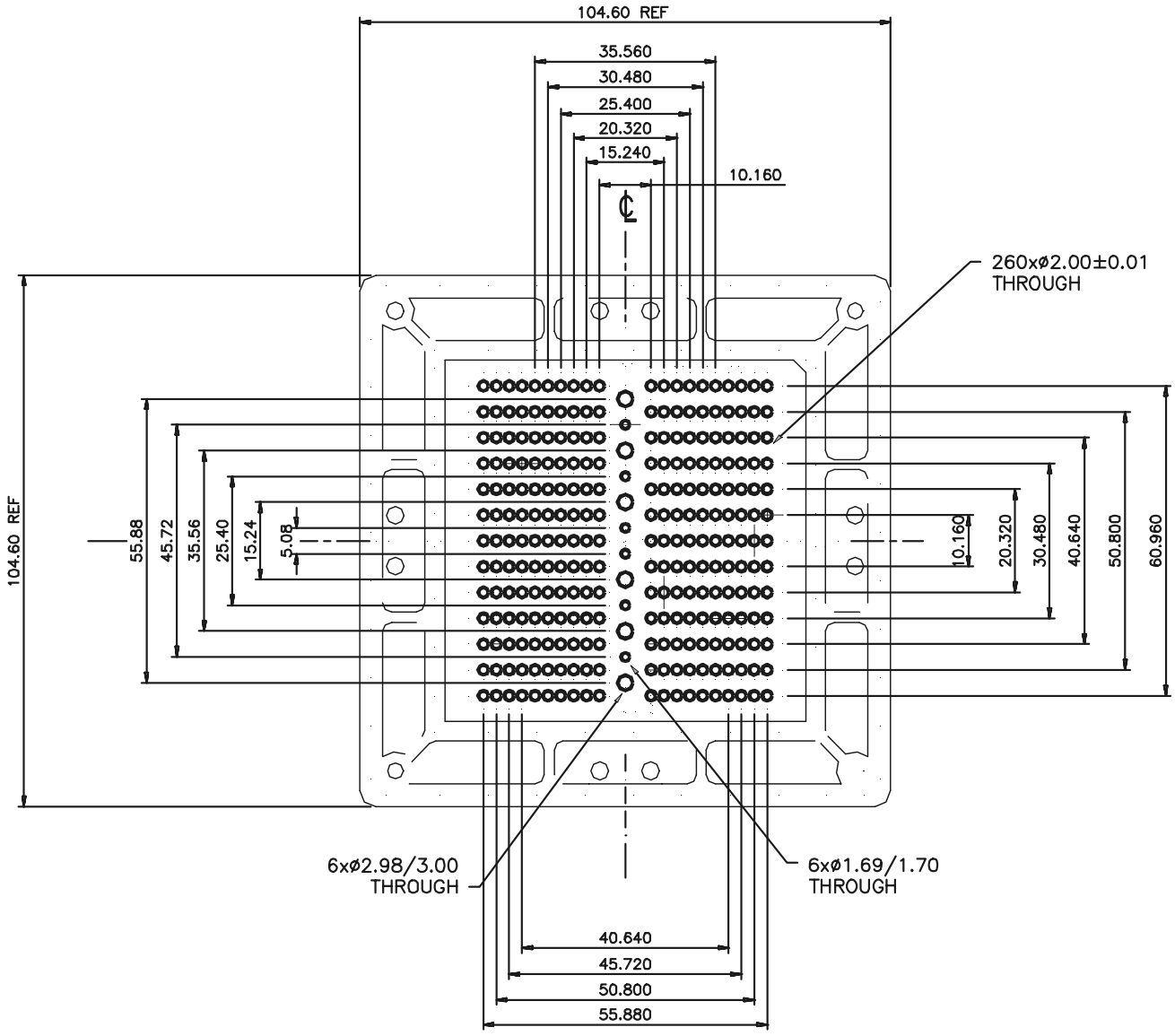
	Probe Housing Box (mm)	Interface Plate (mm)
160 holes for transformer pins	1.0	1.0

The interface plate is accurately drilled at locations corresponding to those in the probe housing box.

Voltech Starter Kit B, part number FSK 100-062 contains a mixture of spring probes and receptacles suitable for the above probe box kit.

5.08mm (0.2”) Probe Box Kit (Part No. FSK 91-198)

For through hole mounting round, rectangular or square pins.	
No. of pins	Up to 26 (13 each side)
Pin pitch	5.08mm
Pitch between rows	10.16mm to 55.08mm in 2.54mm steps.
Pin length	4.0mm to 9.0mm below the level where the transformer will rest on the PCB using Probe Kit A.
Pin diameter	up to 2.0mm (larger blades can be accomodated if slots are cut in the interface plate.)



Drilling details:

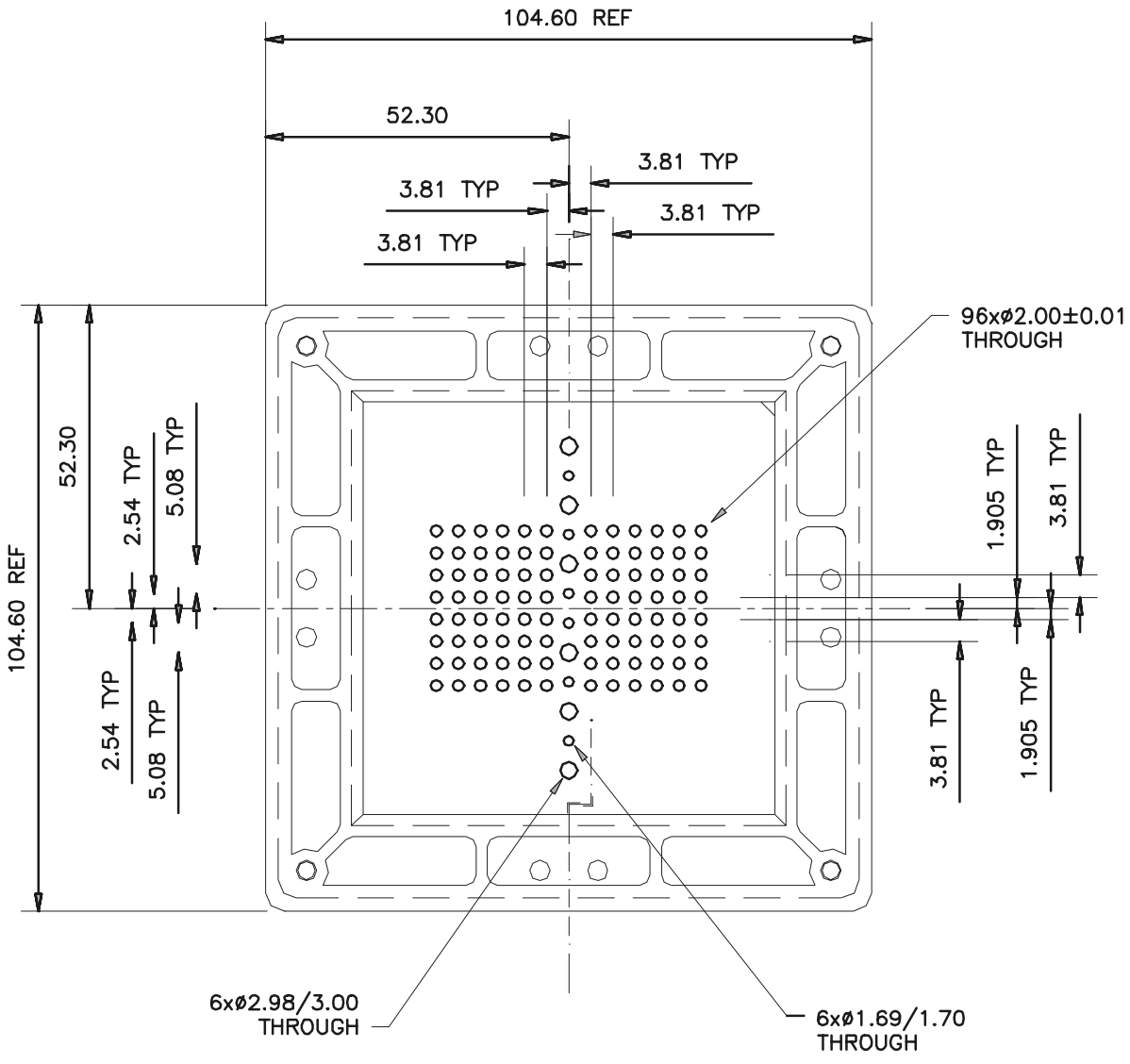
	Probe Housing Box (mm)	Interface Plate (mm)
260 holes for transformer pins	2.0	2.0
Core connections (along centre line)	6 x 1.70	3.0
	6 x 3.00	4.5

The interface plate is accurately drilled at locations corresponding to those in the probe housing box.

Voltech Strarter Kit A, part number FSK 100-061 contains a mixture of spring probes and receptacles suitable for the above probe box kit.

3.81mm (0.15”) Probe Box Kit (Part No. FSK 91-199)

For through hole mounting round, rectangular or square pins.	
No. of pins	Up to 16 (8 each side)
Pin pitch	3,81mm
Pitch between rows	7.62mm to 45.72mm in 3.81mm steps.
Pin length	4.0mm to 9.0mm below the level where the transformer will rest on the PCB using Probe Kit A.
Pin diameter	up to 2.0mm (larger blades can be accomodated if slots are cut in the interface plate.)



Drilling details:

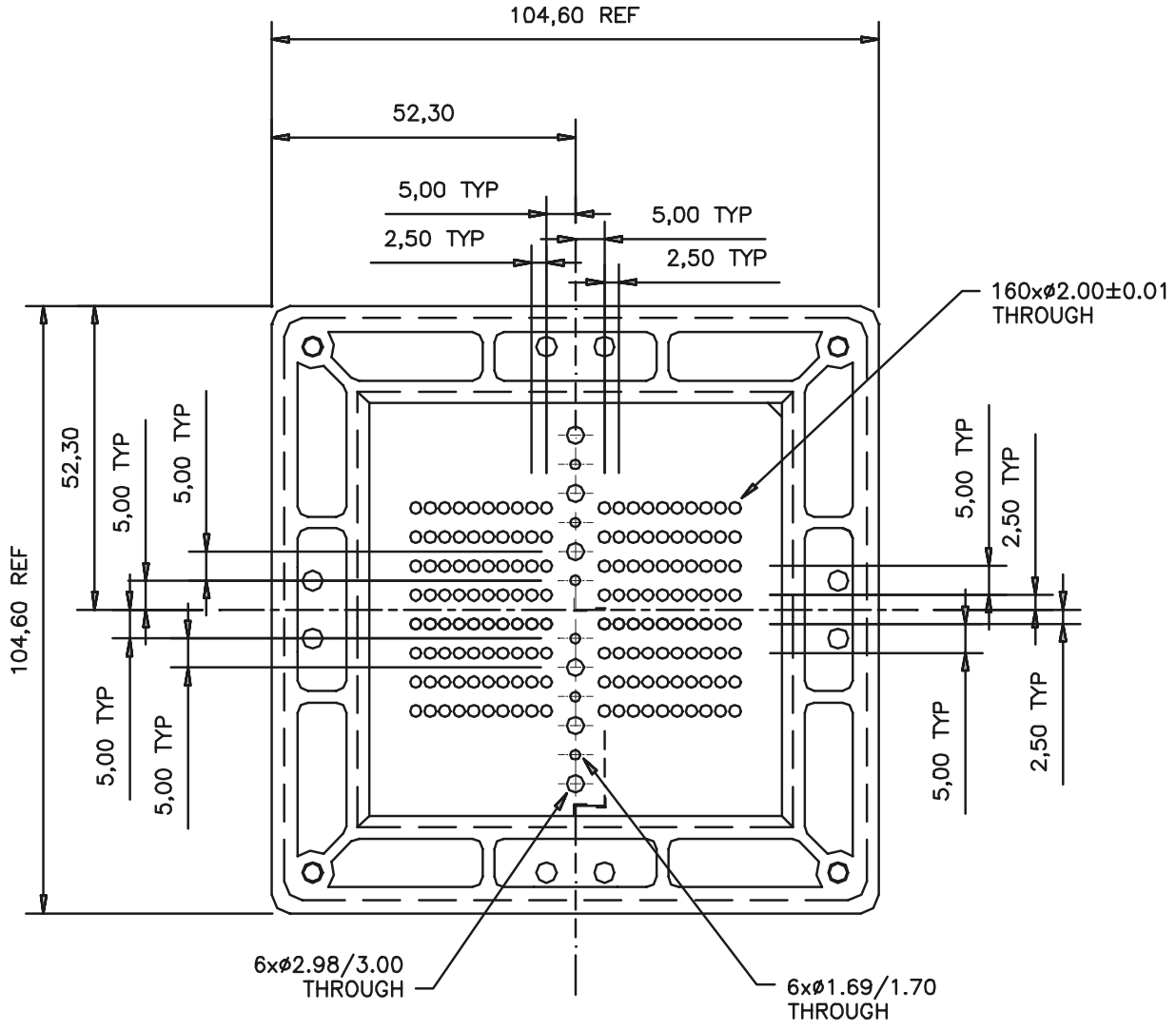
	Probe Housing Box (mm)	Interface Plate (mm)
96 holes for transformer pins	2.0	2.0
Core connections (along centre line)	6 x 1.70	3.0
	6 x 3.00	4.5

The interface plate is accurately drilled at locations corresponding to those in the probe housing box.

Voltech Strarter Kit A, part number FSK 100-061 contains a mixture of spring probes and receptacles suitable for the above probe box kit.

5.0mm Probe Box Kit (Part No. FSK 91-200)

For through hole mounting round, rectangular or square pins.	
No. of pins	Up to 16 (8 each side)
Pin pitch	5.0mm
Pitch between rows	10.0mm to 55.0mm in 2.5mm steps.
Pin length	4.0mm to 9.0mm below the level where the transformer will rest on the PCB using Probe Kit A.
Pin diameter	up to 2.0mm (larger blades can be accomodated if slots are cut in the interface plate.)



Drilling details:

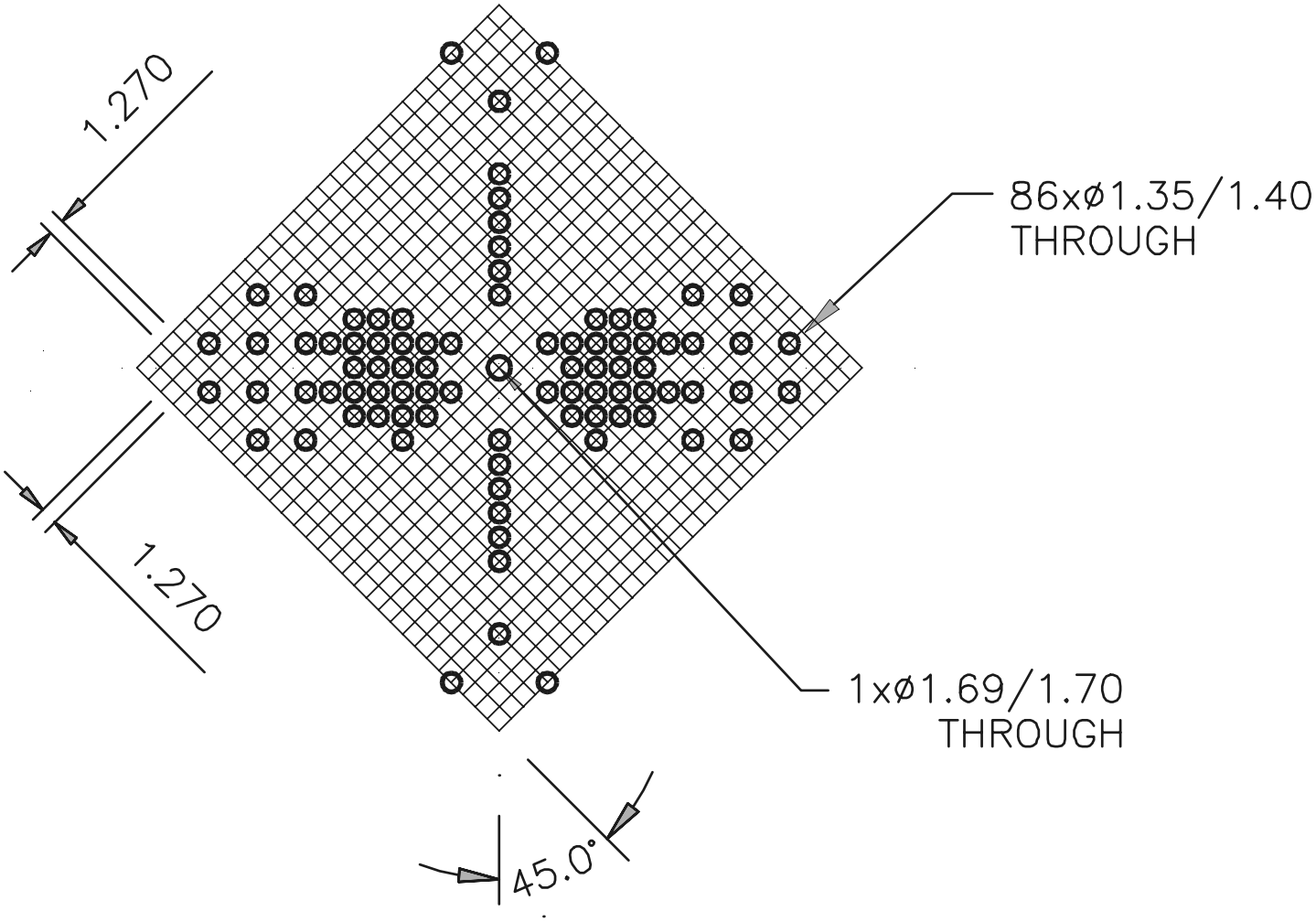
	Probe Housing Box (mm)	Interface Plate (mm)
160 holes for transformer pins	2.0	2.0
Core connections (along centre line)	6 x 1.70	3.0
	6 x 3.00	4.5

The interface plate is accurately drilled at locations corresponding to those in the probe housing box.

Voltech Strarter Kit A, part number FSK 100-061 contains a mixture of spring probes and receptacles suitable for the above probe box kit.

RM Probe Box Kit (Part No. FSK 91-201)

For through hole mounting round, rectangular or square pins.	
No. of pins	Up to 84. See appendix A
Pin pitch	Various arrangements. See appendix A
Pin length	2.0mm to 5.0mm below the level where the transformer will rest on the PCB using Probe Kit C.
Pin diameter	up to 1.52mm



Drilling details:

	Probe Housing Box (mm)	Interface Plate (mm)
86 holes for transformer pins	1.4	1.4
Core connection (at centre)	1.70	3.0

The interface plate is accurately drilled at locations corresponding to those in the probe housing box.

Voltech Strarter Kit C, part number FSK 100-063 contains a mixture of spring probes and receptacles suitable for the above probe box kit.

H. Probe Starter Kits

Each probe starter kit contains a selection of spring probes, receptacles and interconnecting wire suitable for the referenced drilled probe box kit. There are sufficient quantities for most transfomers plus a few spares. Up to two alternative core probe types are provided, but usually only one type is used.

To complete a fixture, you will also need:

- A Voltech Custom Fixture Kit (VPN 91-185).
- An appropriate Drilled Probe Box Kit.
- A clamp to hold the transformer against spring probes.
- 4mm sockets and / or Kelvin clips for flying leads and tags.

See also the section ‘Choosing Connecting Probes, Kelvin Pins and Clips’ if you are not familiar with any of the terminology used here.
The ‘reference’ quoted in the following tables may be found in the probe selection chart later in this manual.

Probe Starter Kit A (Part No. FSK 100-061)

Intended for constructing fixtures based on Drilled Probe Box Kits: 0.15” (FSK 91-199), 0.2” (FSK 91-198), and 5.0mm (FSK 91-200).

Contents:

	Qty.	Ref.
Receptacle KS112	20	9
Spring Probe GKS912	20	9
Receptacle KS925	3	16,19
Receptacle KS113	3	18
Core Spring Probe GKS713-207	2	18
Core Spring Probe GKS725-207	2	19
Core Spring Probe GKS725-257	2	16
Distance Sleeve DS11302 – 2mm	2	
Distance Sleeve DS11303 – 3mm	2	
Distance Sleeve DS11305 – 5mm	2	
Tex-E Triple Insulated Wire	10 metres	

Probe selection chart.

The following chart allows you to select the correct probe for the dimensions of the particular transformer you wish to test. Choose the core probe that maximises the compression of the probe but allows some dimensional tolerance. For example, if the core is 5mm above the interface plate, choose items 18 with a 2mm collar (2.0 to 7.0 mm).

Pin Length	**Core Height**	**Probe. Ref**	**Recep. Ref**	**Set Height**	**Sleeve**
4.0 – 9.0		9	9	0.2	
	0.0 – 5.0	18	18	0.2	
	2.0 – 8.0	16	16	5.5	
	2.0 – 7.0	18	18	2.2	2mm
	3.0 – 8.0	18	18	3.2	3mm
	5.0 – 10.0	18	18	5.2	5mm
	7.0 – 12.0	18	18	7.2	2 + 5mm
	8.0 – 13.0	18	18	8.2	3 + 5mm
	10.0 – 16.0	18	18	10.2	2 + 3 + 5mm

Where pin length and core height are referred to the top of the interface plate. This will be the level at which the transformer rests on the PCB in normal use.

Set height is the distance from the probe housing box to the top of the receptacle.

Probe Starter Kit B (Part No. FSK 100-062)

Intended for constructing fixtures based on Drilled Probe Box Kit: 0.10” (FSK 91-197).

Contents:

	Qty.	Ref.
Receptacle KS080	20	2
Spring Probe GKS080	20	2
Tex-E Triple Insulated Wire	10 metres	

IMPORTANT NOTE:

The ‘Set Height’ for these receptacles should be 2.00mm. Set height is the distance from the probe housing box to the top of the receptacle.

Pin length: 0 to 3.2 mm

Probe Starter Kit C (Part No. FSK 100-063)

Intended for constructing fixtures based on Drilled Probe Box Kits: RM (FSK 91-201). Contents:

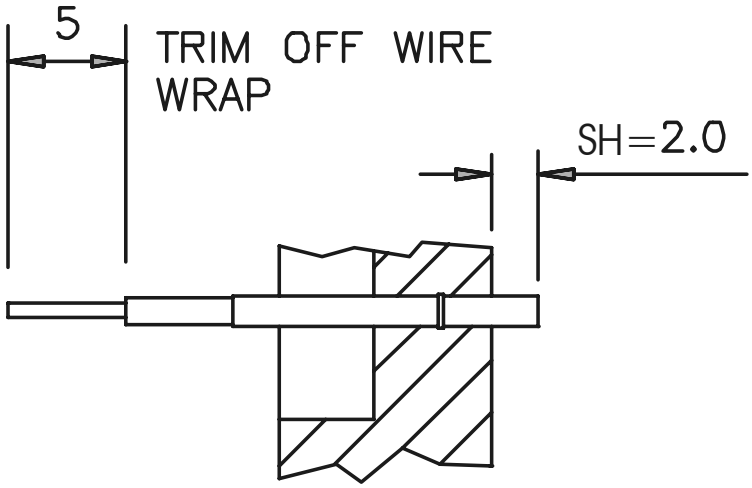
	Qty	Ref.
Receptacle RA2W. SEE NOTE.	20	6
Spring Probe PA2HS	20	6
Receptacle KS925	5	16,19
Core Spring Probe GKS725-207	2	19
Core Spring Probe GKS725-257	2	16
Tex-E Triple Insulated Wire	10 metres	

Probe selection chart.

Pin Length	**Core Height**	**Probe. Ref**	**Recep. Ref**	**Set Height**	**Sleeve**
0 - 3.2		6	6	2.0	
	0.0 – 5.0	19	19	0.2	
	2.0 – 8.0	16	16	5.5	

Note:

Receptacle RA2W (Ref. 6) is a wire wrap type and must be trimmed before use.



The above chart allows you to select the correct probe for the dimensions of the particular transformer you wish to test. Choose the core probe that maximises the compression of the probe but allows some dimensional tolerance. For example, if the core is 4mm above the interface plate, choose items 16 with a 2mm collar (2.0 to 8.0 mm).

I. Probe Replacement Kits

Intended for maintenance of the fixtures manufactured using the Voltech kits described above. The probe replacement kits contain a selection of spring probes only. If you are constructing new fixtures, please see the Voltech Probe Starter Kits above.

Probe Replacement Kit A (Part No. 54-210)

Intended for maintenance of fixtures constructed using Probe Starter Kit A. Contents:

	Qty.	Ref.
Spring Probe GKS912	20	9
Core Spring Probe GKS725-207	2	19
Core Spring Probe GKS725-257	2	16
Distance Sleeve DS11302	2	
Distance Sleeve DS11303	2	
Distance Sleeve DS11305	2	

Probe Replacement Kit B (Part No. 54-212)

Intended for maintenance of fixtures constructed using Probe Starter Kit B. Contents:

	Qty.	Ref.
Spring Probe GKS080	20	2

Probe Replacement Kit C (Part No. FSK 54-214)

Intended for maintenance of fixtures constructed using Probe Starter Kit C. Contents:

	Qty.	Ref.
Spring Probe PA 2HS	20	6
Core Spring Probe GKS725-207	2	19
Core Spring Probe GKS725-257	2	16

J. Kevin Blades (Part No. "Medium Kelvin Kit")

This kit contains 10 blades suitable for use with the Voltech AT Fixture System.

Specification:

Gold plated copper alloy blades mounted in a plastic sleeve.

Minimum pin pitch: 0.15" (3.81mm)
Minimum pin diameter: 0.025" (0.635mm)
Maximum pin diameter: 0.04" (1.016mm)

Drilling of the Probe Housing Box: Use 0.136" (3.4mm) dia. #29 drill.

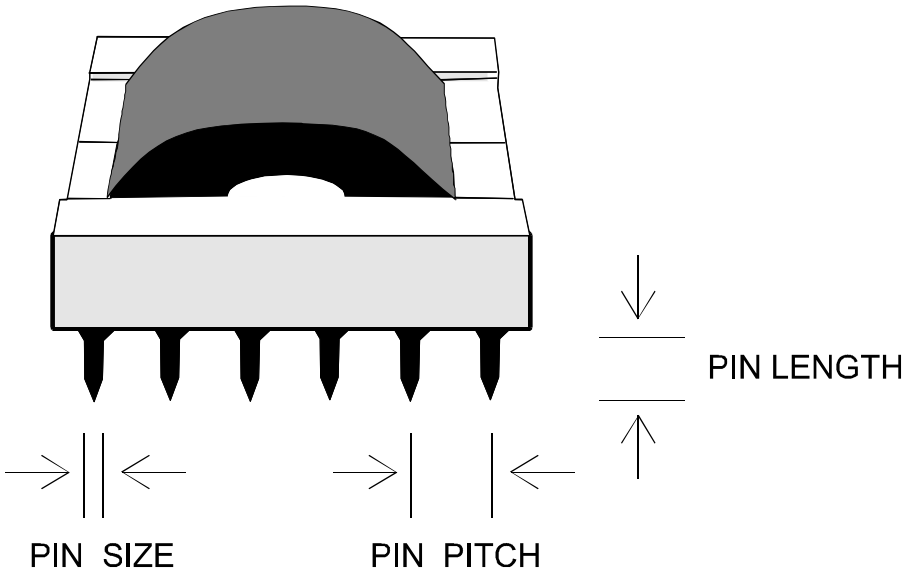
Set Height: 7mm

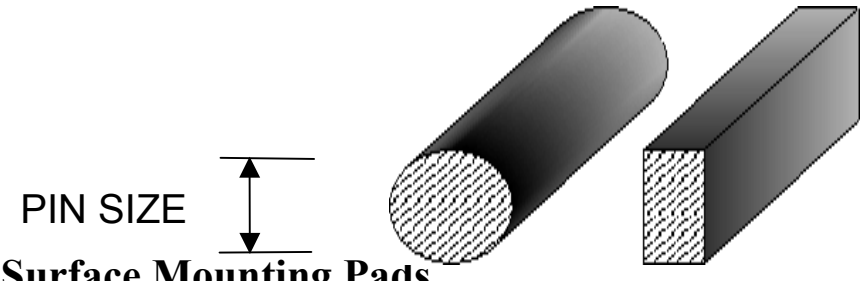
5. CHOOSING CONNECTING PROBES, KELVIN PINS AND CLIPS

The choice of connector used to make contact with the component under test will depend on the type of component lead, its size, orientation, material and finish.

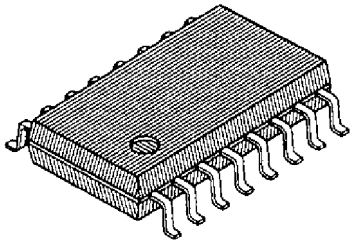
A list of suggested types and manufacturer's data is presented at the end of this section. Other types and manufacturers may be suitable. You are strongly advised to obtain the complete manufacturer's data before purchasing probes, pins or clips.

General Definition of Pin Sizes, Pitch and Length





Surface Mounting Pads

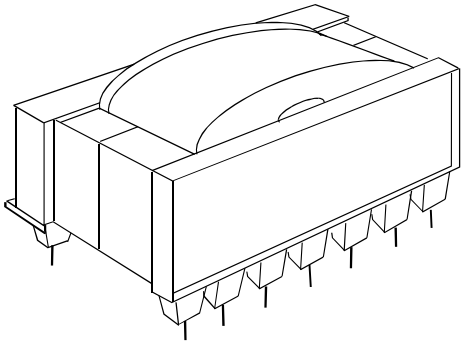


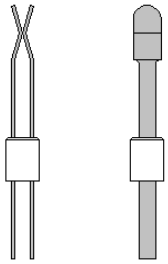
Point Spring Probe Crown Spring Probe

For pad sizes up to 5mm by 2mm, choose a spring probe with a point or crown.

Minimum connection pitch 2.54mm (0.1”).

PCB Mounting Transformers with Pin Sizes up to 1.5mm



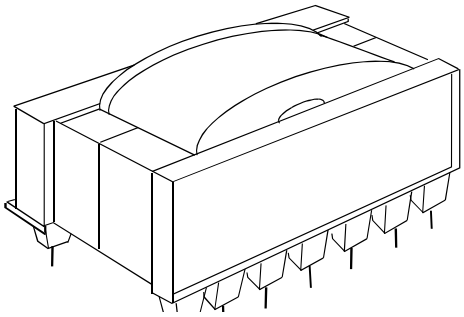


Kelvin Blades

For optimum accuracy, kelvin blades are recommended. (See page 11). The blades provide a four terminal contact direct to the transformer pin.

Minimum connection pitch 5mm (0.2”). Pin length 3.0 to 10.00mm.

PCB Mounting Transformers with Pin Sizes up to 3.0mm



Serrated ***Crown*** ***Cup***

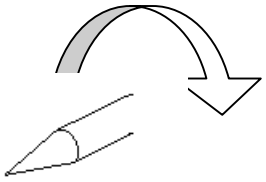
Spring Probes

Use serrated (sometimes called castellated), crown, or cup spring probes for larger pin sizes or if the pin length is short. Must be used with a clamp to hold the transformer against the probes during testing.

Minimum connection pitch 2.54mm (0.1”).

Pin length 2.0 to 5.00mm

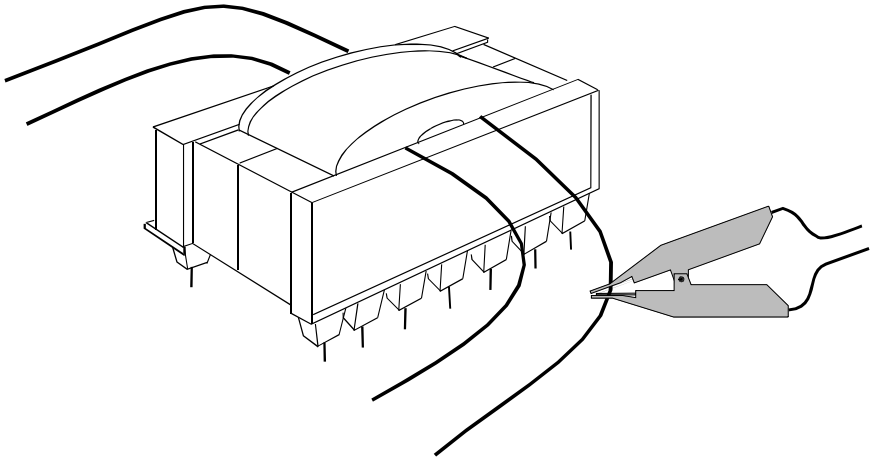
PCB Mounting Transformer Cores



Rotating Point Spring Probe

Rotating point spring probes are recommended so that good contact is made even through varnish coating or surface corrosion.

Connections to Flying Leads and Tags



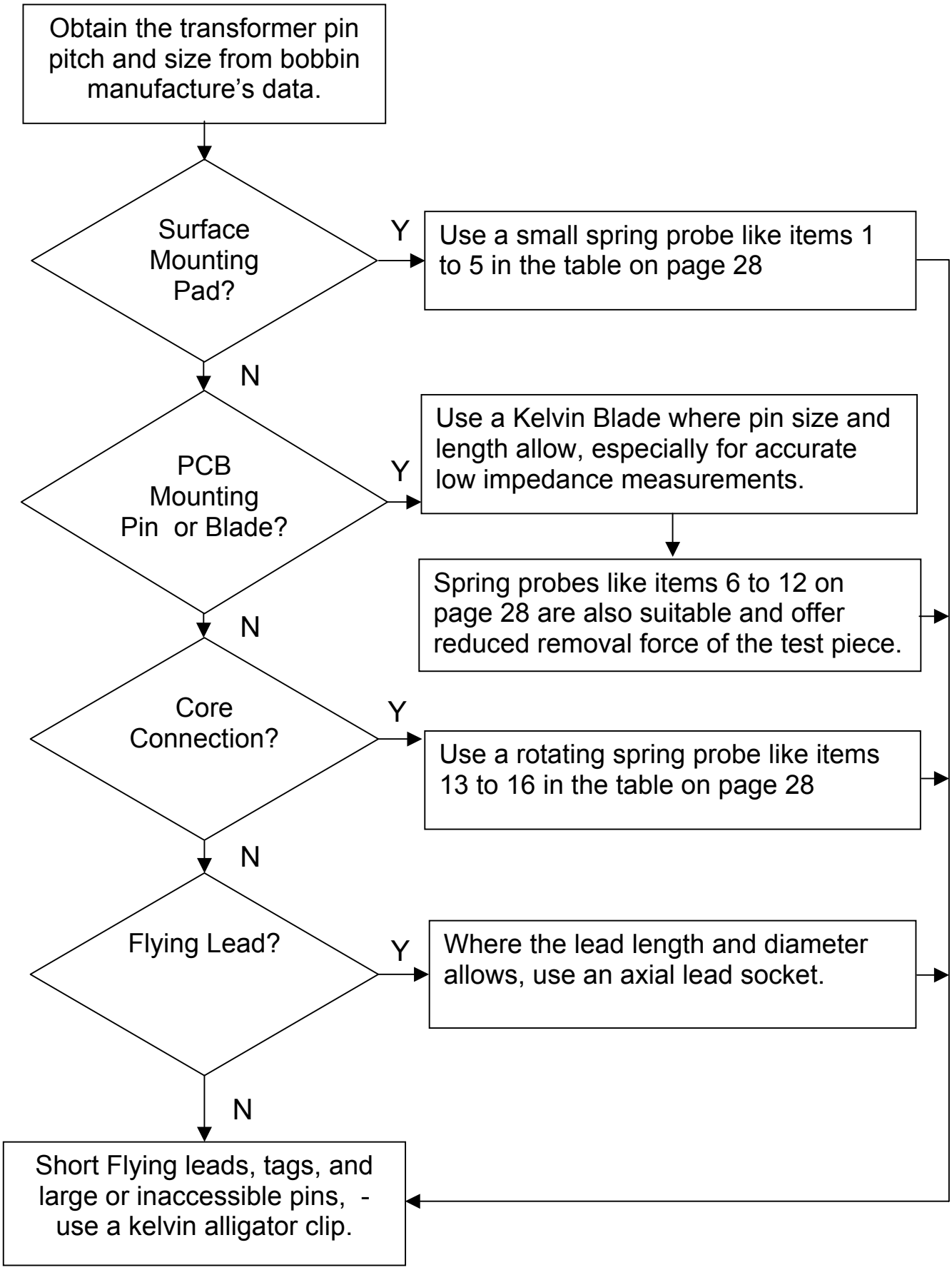
Kelvin connected alligator clips can be used to make connections to larger leads, shorter leads, foil leadouts or tags or screen on the top or side of the transformer.

Screw one face of the clip down against the fixture plate for a permanent, easy-to-use connection.

Other Connections

A wide variety of other connectors can be accommodated on the base plate to terminate flying leads. For example, 4mm sockets, spring terminals or multi-way headers could all be installed.

Pin / Probe / Clip Selection Summary



Spring Probe / Kelvin Pin Selection Chart

	PROBE TYPE												
No.	HEAD	ROTARY or FIXED	COMPONENT CONNECTION	CONNECTION PITCH (INCH)	MAX PAD SIZE (L) - (W)	MAX PIN DIA.	PIN LENGTH MIN - MAX		BLADE SIZE (W) - (T)		BLADE LENGTH MIN - MAX	
1	POINT	FIXED	SMD	(0.10) 2.54	5.0 X 2.0							
2	POINT	FIXED	SMD	(0.10) 2.54	5.0 X 2.0							
3	POINT	FIXED	SMD	(0.10) 2.54	5.0 X 2.0							
4	POINT	FIXED	SMD	(0.10) 2.54	5.0 X 2.0							
5	CROWN	FIXED	SMD	(0.10) 2.54	5.0 X 2.0							
6	CAST	FIXED	PIN	(0.10) 2.54		1.2	2.0	3.5				
7	CAST	FIXED	PIN	(0.10) 2.54		1.2	2.0	3.5				
8	CUP	FIXED	PIN	(0.10) 2.54		1.0	2.0	3.5				
9	CAST	FIXED	PIN / BLADE	(0.10) 2.54		2.0	0.0	1.0	2.0	2.0	2.0	2.0
10	CROWN	FIXED	PIN / BLADE	(0.15) 3.81		1.6	2.0	4.5	2.0	1.0	2.0	4.0
11	CROWN	FIXED	PIN / BLADE	(0.30) 7.62		3.0	2.5	5.0	3.5	1.5	2.5	5.0
12	CAST	FIXED	PIN / BLADE	(0.30) 7.62		3.0	2.5	5.0	3.5	1.5	2.5	5.0
13	CAST	FIXED	PIN / BLADE	(0.30) 7.62		3.0	2.0	3.0	3.0	1.0	2.5	4.0
14	POINT	ROTARY	CORE	(0.10) 2.54								
15	POINT	ROTARY	CORE	(0.10) 2.54								
16	POINT	ROTARY	CORE	(0.10) 2.54								
17	POINT	ROTARY	CORE	(0.20) 5.00								
18	POINT	ROTARY	CORE	(0.20) 5.00								
19	POINT	ROTARY	CORE	(0.10) 2.54								
20	KELVIN CONTACT		PIN / BLADE	(0.20) 5.00		1.5	3.5	10.0	3.5	1.0	3.0	10.0

Pin = round pin.

Blade = square or rectangular pin. Width and Thickness.

Cast = castellated or serrated probe tip.

IMPORTANT. Recommended transformer pin length is based on the use of a ‘Custom Fixture Kit’. If you are using a Voltech ‘Drilled Probe Box Kit’ which includes a 4mm spacer, please refer to the pin length and core probe heights given in that section.

Spring Probe / Kelvin Pin Technical Data

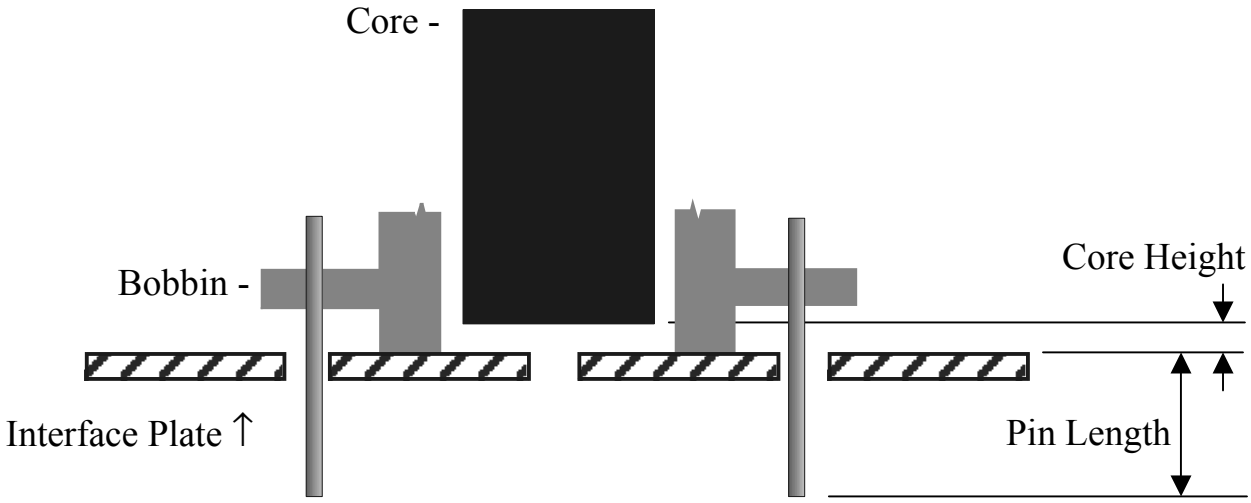
MAXIMUM UUT,HOLE SIZE (PIN)	MAXIMUM UUT,HOLE SIZE (BLADE)	PROBE HEAD SIZE	RECEPTACLE HOLE SIZE	RECEPTACLE SET HEIGHT	PROBE HEIGHT ABOVE INTERFACE PLATE SURFACE	**No.**
1.4		1.1	1.7	7.0	6.5	**1**
1.4		0.8	1.0	0.0	3.7	**2**
1.3		1.04	1.7	5.84	4.0	**3**
2.1		1.92	1.7	7.0	1.5	**4**
2		1.52	1.7	5.84	4.0	**5**
1.4		1.52	1.4	3.0		**6**
1.4		1.52	1.4	3.0		**7**
1.5		1.52	1.45	3.0		**8**
2.5	2.5	2.0	2.0	0.2	3.0	**9**
2.0	2.0	2.3	3.0	0.2		**10**
3.5	4.0	4.0	5.6	1.0		**11**
3.5	4.0	4.0	5.6	1.0		**12**
3.0	3.2	3.5	3.0	0.2		**13**
2.0		1.52	1.7	7.5	7.5	**14**
1.5		1.22	1.4	7.3	7.6	**15**
4.0		2.26	3.0	1.0	5.0	**16**
4.0		2.26	3.0	1.0	5.0	**17**
4.0		2.26	3.0	1.0	10.0	**18**
4.0		2.26	3.0	1.0	10.0	**19**
2.0	3.5		3.2	7.0		**20**

Spring Probe / Kelvin Pin Manufacturers' Details

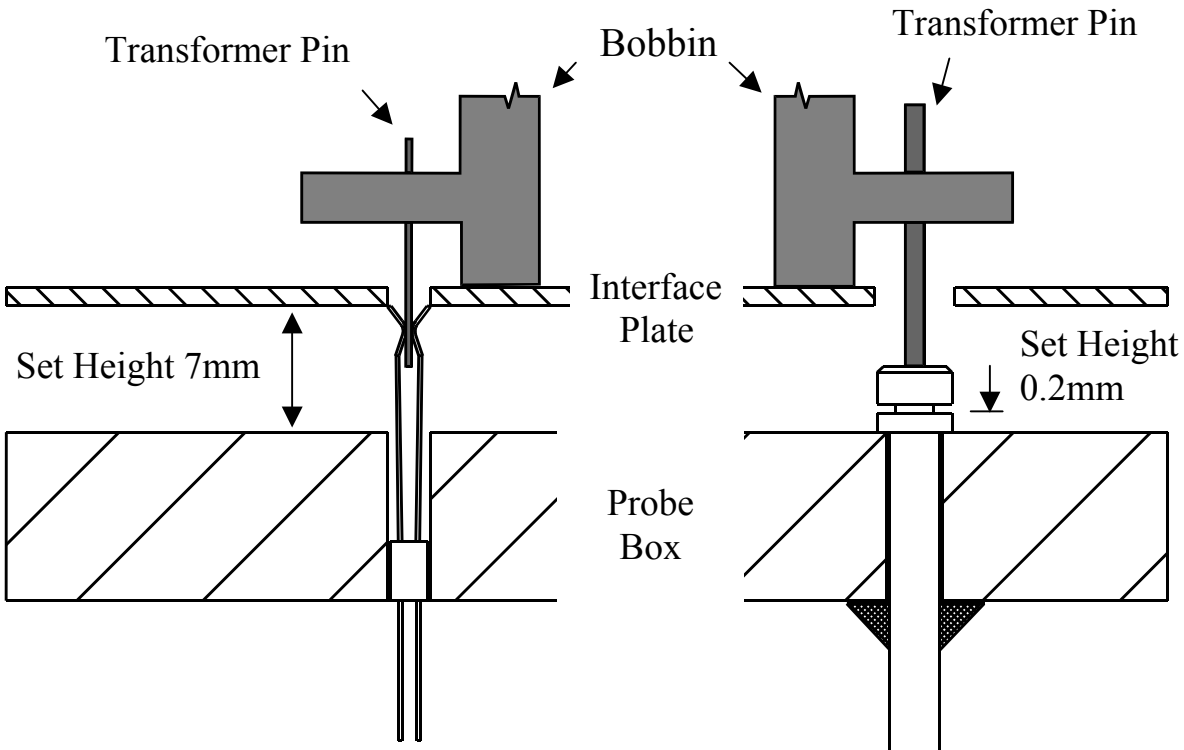
No.	MANUFACTURER	PROBE NUMBER	RECEPTACLE NUMBER
1	CODA/PYLON	P3158G-3C(X)S	S2664-2ETD
2	INGUN	GKS 080 301 035 R 08 05	KS - 080
3	CODA	PA3B(X)	RA3W
4	TEKNIS	P100PLPO563(X)	S2664-2EWWD
5	CODA	PA3Q(X)	RA3W
6	CODA	PA2HS	RA2W
7	CODA	PA2H(X)	RA2W
8	PROBUS	S-1-A-(X.X)-G	RA2W
9	INGUN	GKS-912-306-200-R-08-02	KS-112-23
10	INGUN	GKS-913-306-230-R-(XX)-02-1	KS-113-23
11	INGUN	GKS-364-204-400-N-(XX)-01	RKS-365-23
12	INGUN	GKS-365-206-400-A-(XX)-01	RKS-365-23
13	CODA	PC8HS-138	RC8S
14	IDI	SX25T-(X.X)-DGDRT	R-25-SC
15	IDI	SXL-1-LM-(X.X)-DRT	RL-1-SC
16	INGUN	GKS-725-257-100-R-1507-S	KS-925 30G
17	INGUN	GKS-713-257-225-R-5007	KS-113-23
18	INGUN	GKS-713-207-225-R-5007	KS-113-23
19	INGUN	GKS-725-207-100R-1507-S	KS-925 30G
20	WILCO OR VOLTECH		

Where (X) or (XX) denotes the manufacturers' code for probe force rating.

Pin Length and Core Height Definition

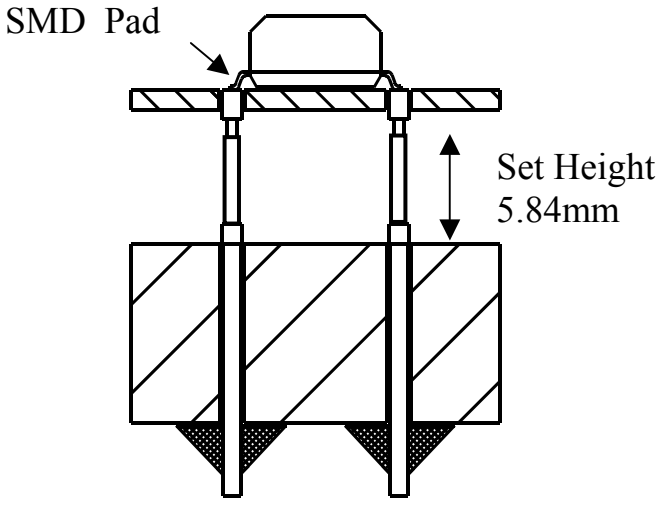


Example Installations Shown in their Working Positions



Kelvin Blade (Item 20)

Spring Probe (Item 9)



Spring Probe (Item 5)

Calculating Required Probe Force

For ideal conditions, the transformer should be just balanced in equilibrium before clamp pressure is applied. That is, the downward force due to the weight of the transformer should be equal to the total spring probe force upwards. This is often not practically possible, so choose probes with initial forces that total up to the transformer mass plus 20%.

$$\frac{\text{Transformer Mass}}{\text{Total No. of Probes}} = \text{Mass per Connection} = \text{Initial Probe Force}$$

Example where the probe force is specified in Newtons:

A Transformer weighs 200 grammes (= 0.2 kilogrammes, Kg) and has a total of 10 connections (8 to windings + 1 screen and 1 core)

$$\text{Mass per connection} = \frac{0.2\ \text{kg} \times 10}{10\ \text{connections}}\ (\text{Newtons}) = 0.2\ \text{Newtons}$$

Spring probes with an initial force of 0.2N *or slightly more* should be chosen.

Example where the probe force is specified in grammes:

A Transformer weighs 200 grammes and has a total of 10 connections (8 to windings + 1 screen and 1 core)

$$\text{Mass per connection} = \frac{200\text{g}}{10 \text{ connections}} = 20 \text{ grammes}$$

Spring probes with an initial force of 20 grammes *or slightly more* should be chosen.

Example using ounces:

A Transformer weighs 10 ounces and has a total of 10 connections (8 to windings + 1 screen and 1 core)

$$\text{Mass per connection} = \frac{10 \text{ Oz}}{10 \text{ connections}} = 1 \text{ Oz}$$

Spring probes with an initial force of 1 Oz *or slightly more* should be chosen.

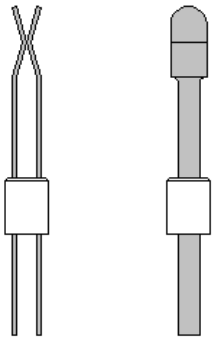
Notes:

- Do not mix the formulae; use one of them only.
- In the Metric formula using Newtons only, multiply the transformer weight by 10 to calculate its' downward force in Newtons due to gravity.
- Rotating and other probes designed to make connections to cores should have significantly higher initial force (between 2 and 5 times higher) to ensure good contact to coated surfaces.
- Remember that the fixture may be used for transformers with different combinations of windings on the same bobbin. Voltech recommends that if, for example, the bobbin has 10 pins then the fixture should be designed to connect to them all (using 10 probes) even if a particular sample has connections to only a few of the pins.

  In this way the applied probe pressure is even across the bobbin and different winding designs can be tested without altering the fixture or constructing a new one.

Manufacturers' Contact Details

Kelvin Blades



USA:

Wilco Fixtures and Pins Tel: 978 345 1929

Spring Probes

As well as the probe, you must purchase the appropriate receptacle as detailed in the selection chart. The receptacle is the fixed part of the spring probe assembly that is secured to the probe housing box.

USA

Everett Charles Technologies
909 625 5551
www.ectinfo.com

IDI
913 342 5544

QA Technologies
603 926 0348

Ingun (RNS International - NC)
704 329 04 44
www.ingun.com

UK

Coda Systems Ltd.
+44 1376 343802
www.coda-systems.co.uk

Teknis Ltd
+44 (0) 1823 481 248
www.teknis.co.uk

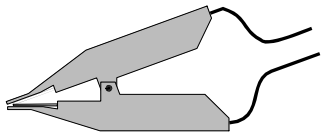
Probus Electronics Ltd
+44 181 866 7272

Ingun
+44 1494 472839
www.ingun.co.uk

Kelvin Alligator Clips Part No CR006 are available from:

USA Globtek 201 784 1000

UK Bulgin +44 (0) 181 594 5588



Interconnecting Wire

To complete the fixture, the probes, pins and clips will need to be wired to the contact pins on the bottom of the base plate as described later. For safe and efficient wiring, Voltech recommends a single stranded wire with 'triple insulation' such as:

0.44mm TEX-E from Furukawa Electric Co.

USA FENA 770 487 1234

UK SEG Technologies +44 (0) 1203 418 975

6. FIXTURE CONSTRUCTION

Having selected and purchased appropriate kelvin blades and / or spring contact probes or and / or flying lead connectors you are ready to begin fixture assembly.

You will also need:

- A Voltech custom fixture kit.
- A suitable Voltech Drilled Box Kit

  OR

  A Voltech drilling template to suit the pitch of the transformer. (Use the bobbin manufacturer's data for pitch where possible. The difference between 2.50mm and $^{1}/_{10}$" for example, is small and may be difficult to measure accurately from a sample.) A small vertical pillar drill for drilling the probe box, interface plate and base plate will also be required if you do not have a pre-drilled kit.
- Hand tools for assembling nuts and screws and making soldered connections.
- Wire for making the electrical connections.

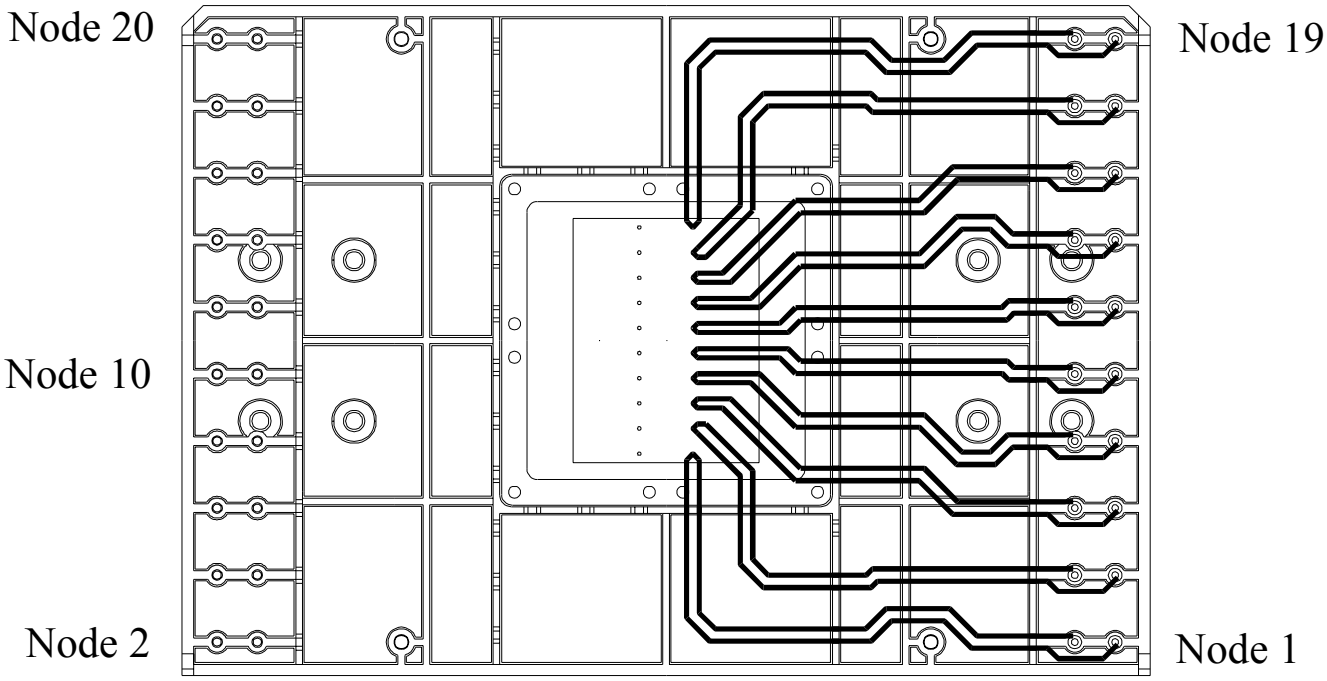
  (See the recommendation on page 35. Alternatives should have a 3000Vac / 2A continuous rating). Wire is included within the Voltech probe starter kits.
- Low bloom cyanoacrylate adhesive such as Loctite Super Glue Gel.

Overall Layout

On the completed fixture, the transformer should be fitted centrally. This will ease the layout of wiring and ensure the clamp (if used) lines up properly.

Consider also the position and lead length of flying leads or tags that will require an operator for connection. It may be easier if these can be brought out to the front or the free side of the fixture. (The clamp can be fitted to the left or right.)

Then design the wiring of the fixture. That is the wiring from the kelvin pins / spring probes / kelvin clips to the 20 pairs of contacts fitted to the underside of the base plate. For best performance and longevity the wiring should be as short as possible and wires should not cross.



Ideal Wiring Layout from the UNDERSIDE

It is usual to line up a safety isolating transformer with primary and secondary pins on different sides of the fixture to minimise voltage stress on the wiring during HiPOT testing.

IMPORTANT NOTE: Some models of the AT Series testers may only be fitted with nodes 1 to 10. Check that the model of tester you are going to use has all 20 nodes fitted if you intend to use them.

Drilling The Interface Plate

(Not required if you have a pre- drilled box kit)

1. Select the drilling template which matches the pin pitch of the transformer you are going to use. (Use the bobbin manufacturer's data rather than measurement where possible).
2. Apply masking tape over the holes on the template face. (Drill from this side).
3. Punch holes in the masking tape with a small needle so that the same profile of pins on the transformer is the same as on the drilling plate. Add extra holes in a suitable position for core connections if required.
4. Place the pre-marked template into the interface plate so that the corner cut-out in the interface plate lines up with cut-out in the stencil.
5. Hold the template down into place with 4off stencil holding drilling clips (supplied) in each corner.
6. Drill the glass board through the pre-marked position in the masking tape with a drill bit 0.1mm smaller than the hole size of stencil.
7. Remove the holding clips and template from the drilled interface plate.
8. Re-Drill the holes in the interface plate to the required size to suit the probe type or Kelvin pin using the existing pre-drilled holes as guides.

9. Clean off all drilling swarf from both sides of the interface plate.

Notes to interface plate drilling:

- Ensure that the holes for the transformer positions are centrally on the drilling plate.
- Keep a large clearance as possible between Winding Pin Terminations and Core Connections.
- The drill bit used for drilling through the template and glass board must be a minimum of 5mm long.
- Ensure that the stencil is held firmly in all four positions onto the glass board before drilling.
- To Ensure all holes are perpendicular in the interface plate, use a pillar drill with the interface plate placed flat.
- DO NOT USE THE STEEL STENCIL FOR THE RE-DRILLING OF THE INTERFACE PLATE
- Keep the coded stencil for drilling of the probe box.

Drilling The Probe Housing Box

(Not required if you have a pre- drilled box kit)

1. Use the drilling template which was used to produce the interface plate that matches the pin Pitch of the part you are going to test.
2. Place the pre-marked template into the probe box so that the corner cut-out in the probe box lines up with cut-out in the stencil.
3. Hold the template down into place with the 4off stencil holding drilling clips (supplied) on each internal side wall.
4. Drill the grey plastic through the pre-marked positions in the masking tape with a drill bit 0.1mm smaller than the hole size of the stencil.
5. Remove the holding clips and stencil from the drilled Probe box.
6. Re-Drill the holes in the probe box to the required size to suit the probe type receptacle or Kelvin pin using the existing pre-drilled holes as guides.
7. Clean off all drilling swarf from both sides of probe box.

Notes to drilling the probe housing box:

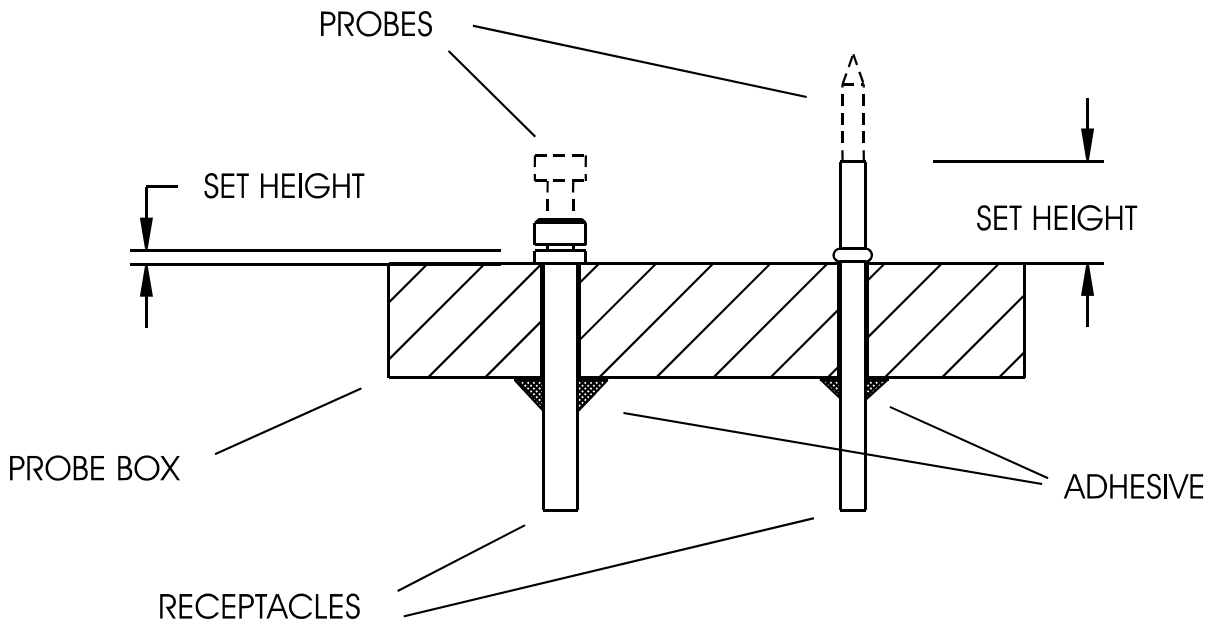
- To ensure that all holes are perpendicular in the probe box, use a pillar drill with the box placed flat.
- The drill bit used for drilling through the template and grey plastic must be a minimum of 10mm long.
- Ensure that the template is held firmly in all four positions onto the grey plastic plate before drilling.
- DO NOT USE THE STEEL TEMPLATE FOR THE RE-DRILLING OF THE PROBE BOX.

Spring Probe / Receptacle and Kelvin Assembly

PROBE / RECEPTACLE ASSEMBLY

If you are using a Voltech Drilled Probe Box, or you have drilled the probe box youself to suit multiple bobbin types, first mark the holes that you are going to fit with receptacles by placing a sample bobbin into the top surface of the probe box and marking the underside with a felt-tipped pen. Do not use a lead pencil.

1. Push the probe receptacle down to the required Set Height (see the probe selection chart or manufacturer's data) using a plastic receptacle installation tool (available from the manufacturers). If you are using a Voltech kit, see the set height information given on page 37 onwards of this manual.
2. Apply cyanoacrylate adhesive to secure the receptacle into the probe box plate.
3. After the adhesive has cured, insert the required probe into the receptacle using a plastic probe installation tool.

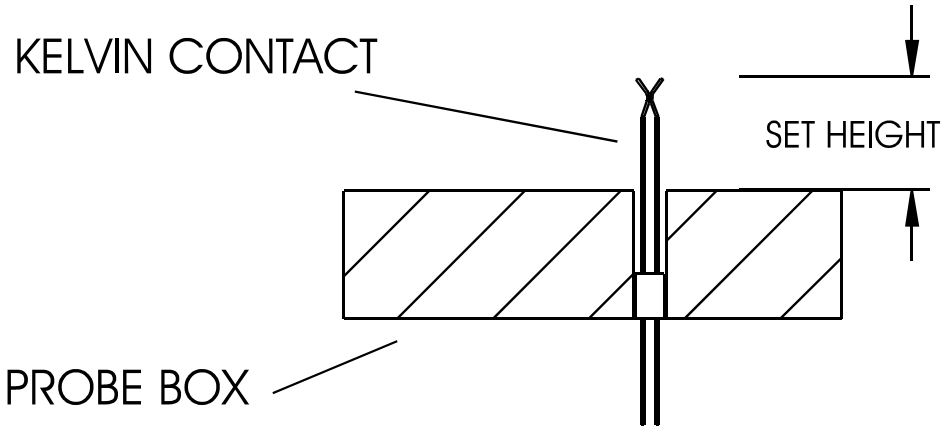


Notes:

- Check that the receptacle is at the correct height before applying adhesive.
- Ensure that wire wrap pins and solder termination areas are free from adhesive.
- Ensure that the adhesive does not get into probe location hole in the receptacle.
- Ensure that probes are fully seated into the receptacle.

KELVIN CONTACT ASSEMBLY

Push the kelvin contact into the probe box plate from the underside to the required set height



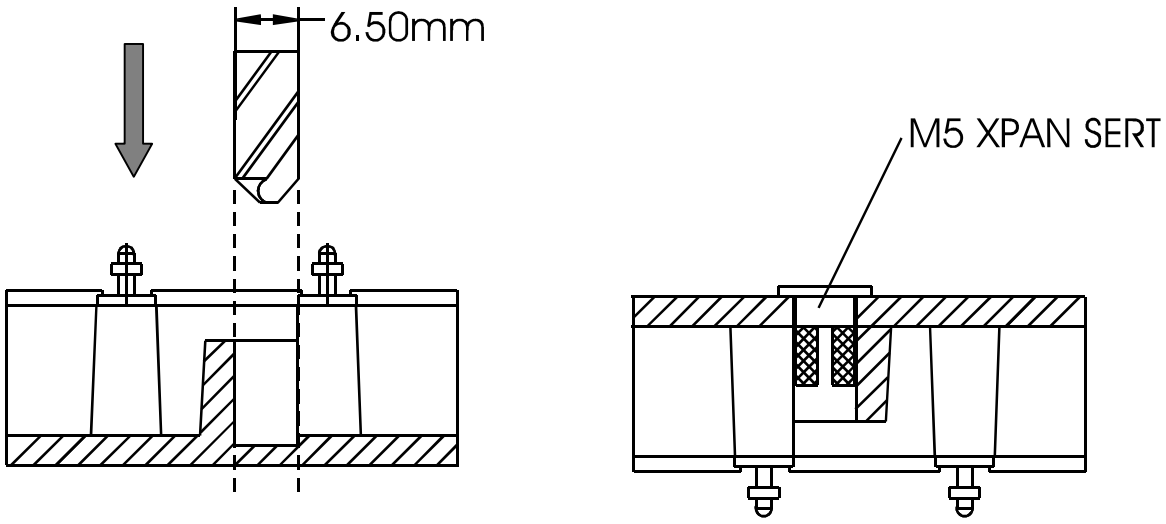
Notes:

- Ensure that the Kelvin Blade opening is in the correct orientation before inserting it into the probe box.
  Refer to Transformer specifications for blade orientation.

DRILLING and ASSEMBLY of CLAMP FIXINGS AND 4mm SOCKETS

DRILLING & FITTING OF CLAMP INSERTS.

1. Select which side the Clamp is to be mounted, left or right.
2. Turn the Main Plate over and using the 4 nominated insert bosses as guides, drill through with a 6.5mm ∅ drill bit to the top surface.
3. Remove all drilling swarf from both sides of plate.
4. From the top face of the base plate press in 4 x M5 Xpan serts (supplied with the clamp) flush with the plate surface.

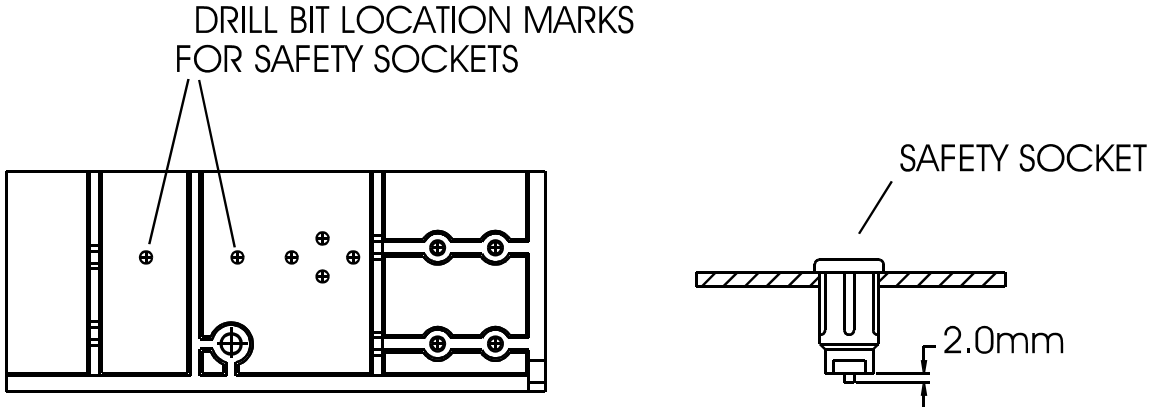


Notes:

- To ensure that all holes are drilled perpendicular in the base plate, use a pillar drill.
- Ensure that the base plate is fixed securely down at all times when drilling holes.
- Ensure when pressing in the inserts that pressure is applied uniformly to the face of insert.

DRILLING & FITTING OF 4mm SAFETY SOCKETS

1. Select and mark the drill locations which require 4mm sockets out of the nearest two parallel rows of markings from the centre of the underside of the base plate.
2. Turn the plate over, and using the nominated drill bit location marks as guides, drill through with a 12.2mm ∅ drill bit to the top surface.
3. Remove all drilling swarf from both sides of the plate.
4. Cut down a socket connecting pin to 2mm from the socket body with heavy-duty side cutters or a hacksaw.
5. Press the modified safety sockets into the drilled holes in top face.



Notes:

- To ensure that all holes are drilled perpendicular in the base plate, use a pillar drill.
- Ensure that the base plate is fixed securely down at all times when drilling holes.
- Ensure when pressing in the sockets that pressure is applied uniformly to the face of socket.

ASEMBLING THE PROBE HOUSING BOX, BEZEL and INTERFACE PLATE

BEZEL/PROBE BOX and INTERFACE PLATE

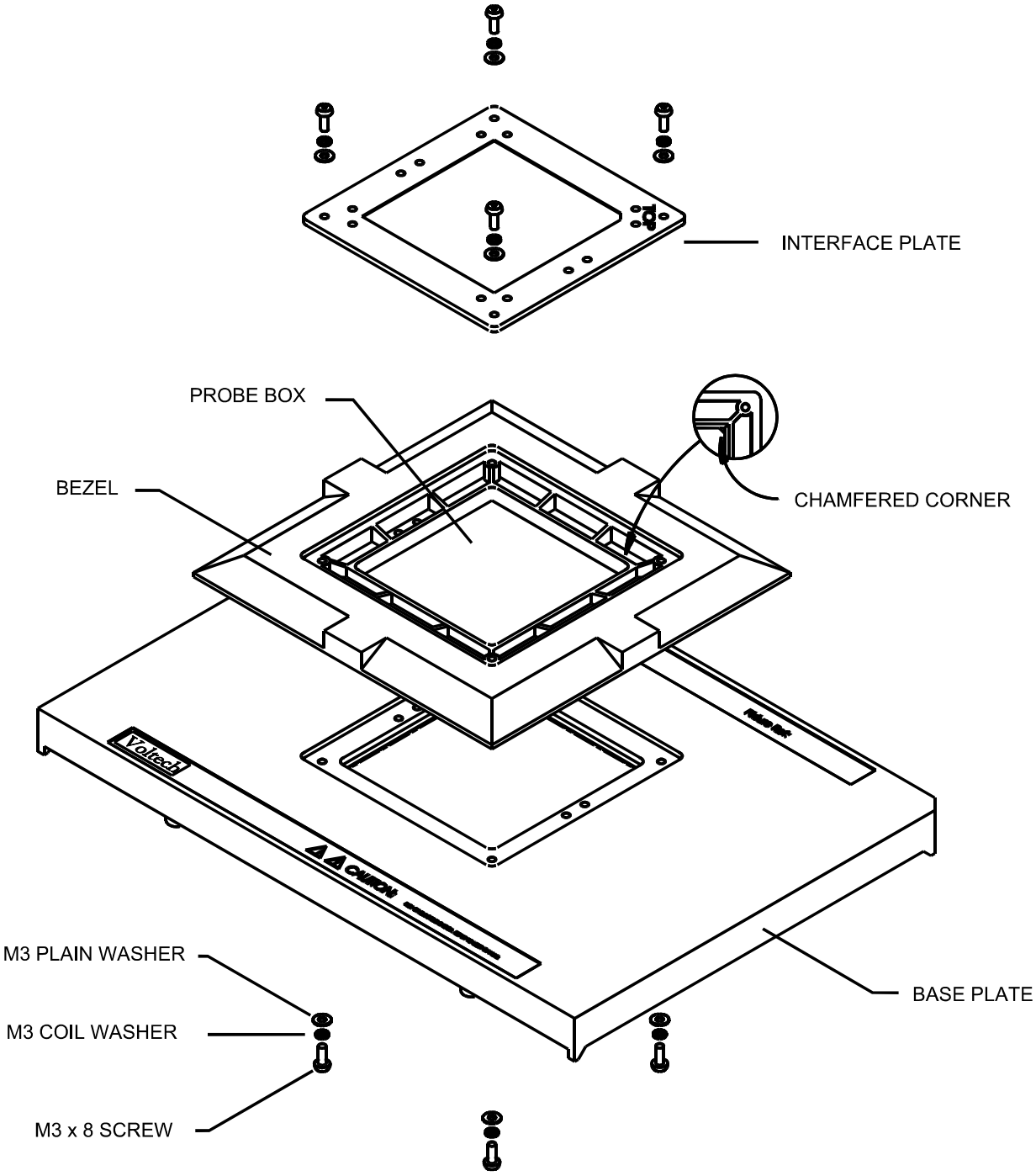
1. Place the bezel onto the base plate, then insert the modified Probe Box into the Bezel and centre the hole in the base plate.
2. Secure into position from the underside of the base plate with 4off M3 x 8mm screws and 4off M3 plain washers. Tighten until the bezel is held firm.
3. Place the modified interface plate into the bezel aperture on top of the probe box with both cut-off corners lining up with each other. Secure into position with 4off M3 x 8mm screws and 4off M3 plain washers. Tighten until the interface plate is held firm.

USING A VOLTECH PRE-DRILLED PROBE BOX KIT

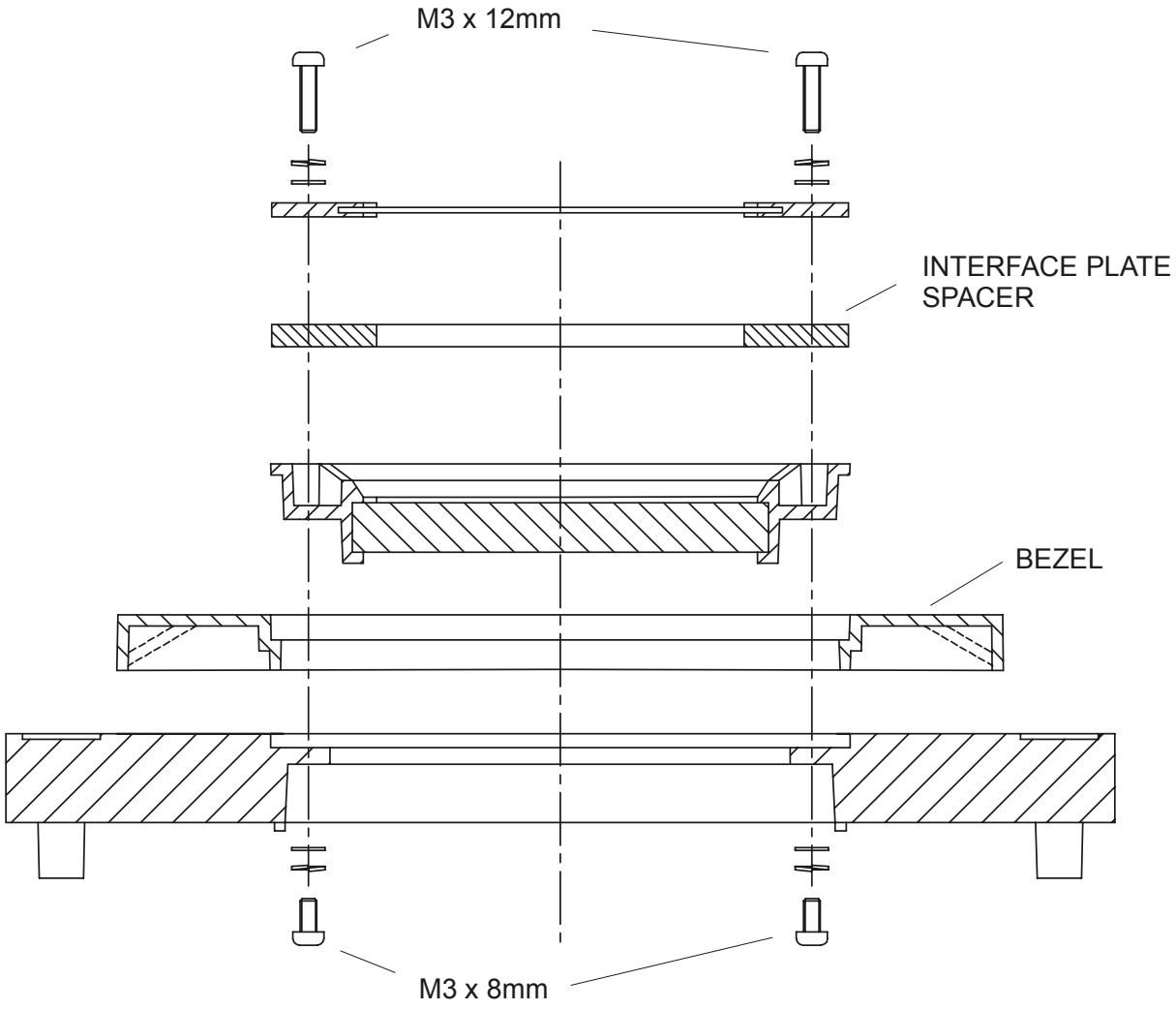
Follow the instructions above, remembering to fit the supplied interface spacer in between the assembled bezel and the interface plate. Secure the interface plate using the 4 OFF M3 x 12mm screws supplied with the Drilled Box Kit, NOT the M3 x 8mm screws.

General Note:

Ensure that the modified probe box is in the correct orientation to the base plate. I.e. the cut-off corner in the probe box is top right relative to the two corner chamfers, which are top left and right.



Probe Housing Box, Bezel and Interface Plate Assembly Using STANDARD Parts



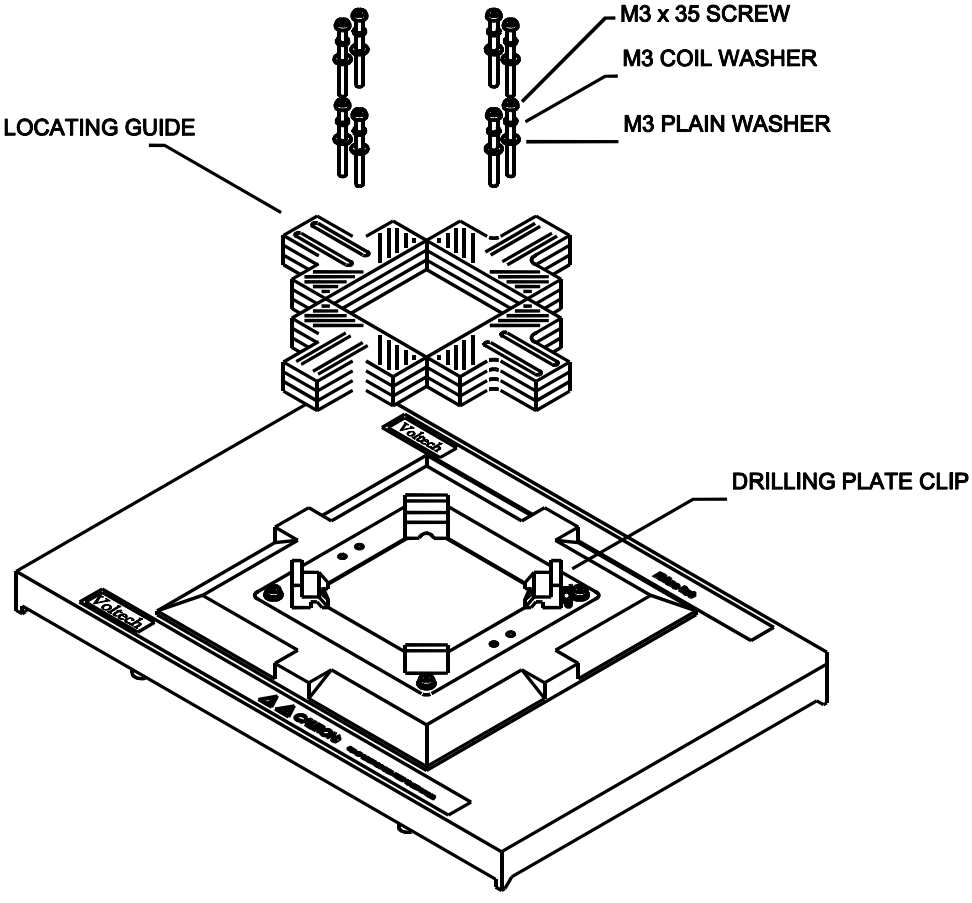
Probe Housing Box, Bezel and Interface Plate Assembly Using a Voltech PRE-DRILLED BOX KIT

Transformer Guide Assembly

If required, guides can be fitted into four locations around the interface plate for transformer registration. The guides greatly simplify the loading of transformers.

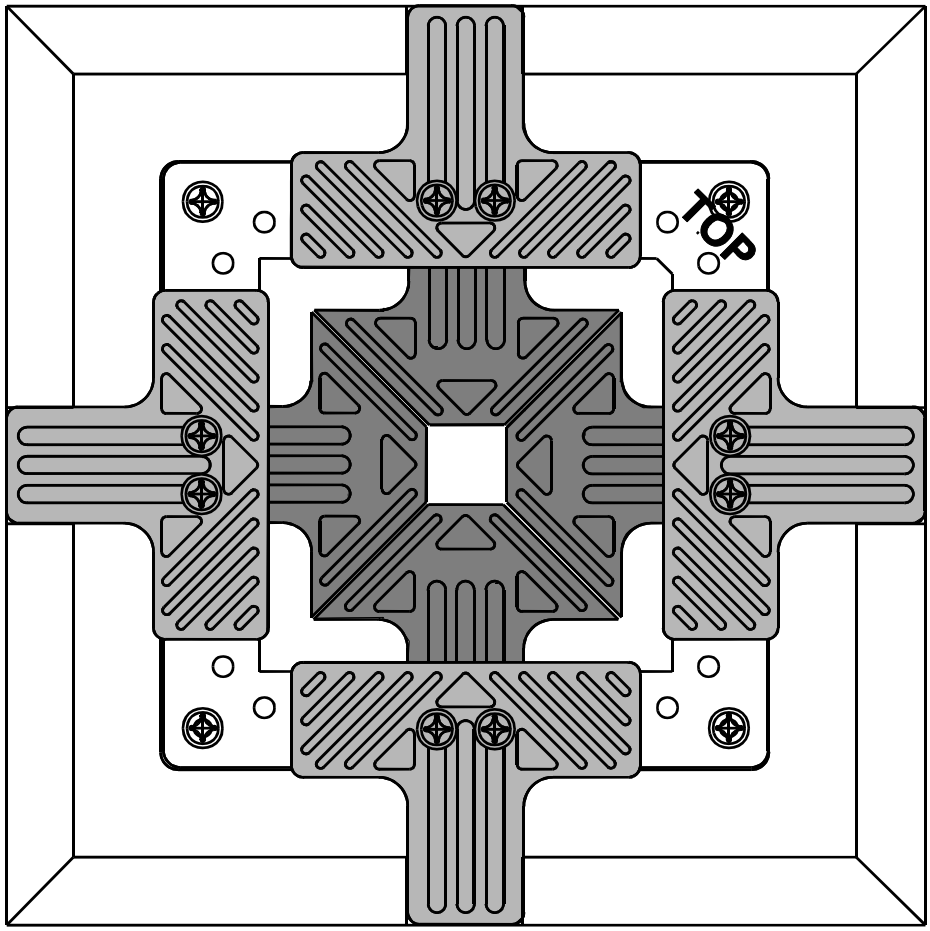
They may be fixed in a single layer (5mm) high or in multiple layers six high (30mm). Each Guide can be cut down via angled cut location slots. This allows transformers with plan areas as small as 3mm to be accommodated. Surface Mount Transformers can be accommodated by using the stepped down portion on one side of the guide.

1. Secure the guides with 8off M3 x 35mm screws, 8off M3 single coil washers and 8off M3 plain washers.



Notes to guide assembly:

- Mount guides in positions so that they locate on the transformer surface which has a fixed position relative to the connection pins or tabs.
- When aligning guides to the transformer surface allow 0.25-0.50mm gap between transformer and guide for easier registration.
- Do not over tighten the M3 screw. 0.8Nm is recommended.
- A standard hacksaw can be used to cut off angled sections from guides



Maximum and Minimum (Chamfered) Guide Positions

Assembling the Clamp to the Base Plate

The number of (1cm) height blocks required to raise the clamp off the main plate is determined by:

Transformer Height (cm) + 1cm

(Rounded up to the next full cm)

E.g. Transformer Height 4.2cm

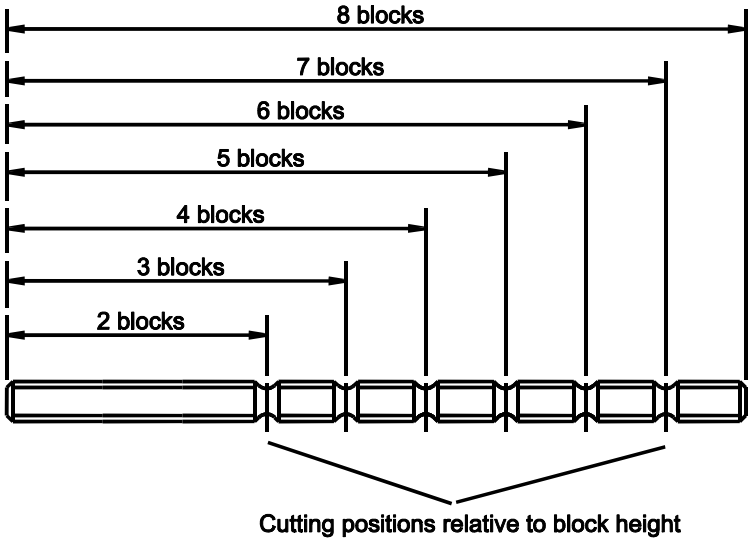
+ 1.0cm

= 5.2cm

= 6.0cm (rounded up)

Which @ 1cm/Block ____ = 6 Blocks Required.

To determine the length of M5 stepped rod required add one more 'block' and cut on that line. 6 blocks, cut the rod at 7 'blocks' line.
2 blocks to be used, cut at the 3 block line etc.



1. Assemble onto the longest non-stepped section of M5 stepped rod:
   1off shoulder washer with step down part facing stepped section(s) of the rod
   1off M5 plain washer
   1off M5 dome nut screwed fully on.
   (Make 4off assemblies as above.)
2. Thread all four M5 assemblies though the clamp fixing holes and though the required number of height blocks from the red handle side of the clamp into 4off brass inserts in the base plate.
3. Tighten each dome nut alternately until their is no gap between the height blocks and the base plate surface.

Notes:

1. Ensure you only cut in the centre part of the step section when cutting stepped rod down to required length.

WARNING:

Always cut the stepped rod to the correct length. If the rod is too long it may reach a live contact on the underside of the base plate and create a potential safety hazard.

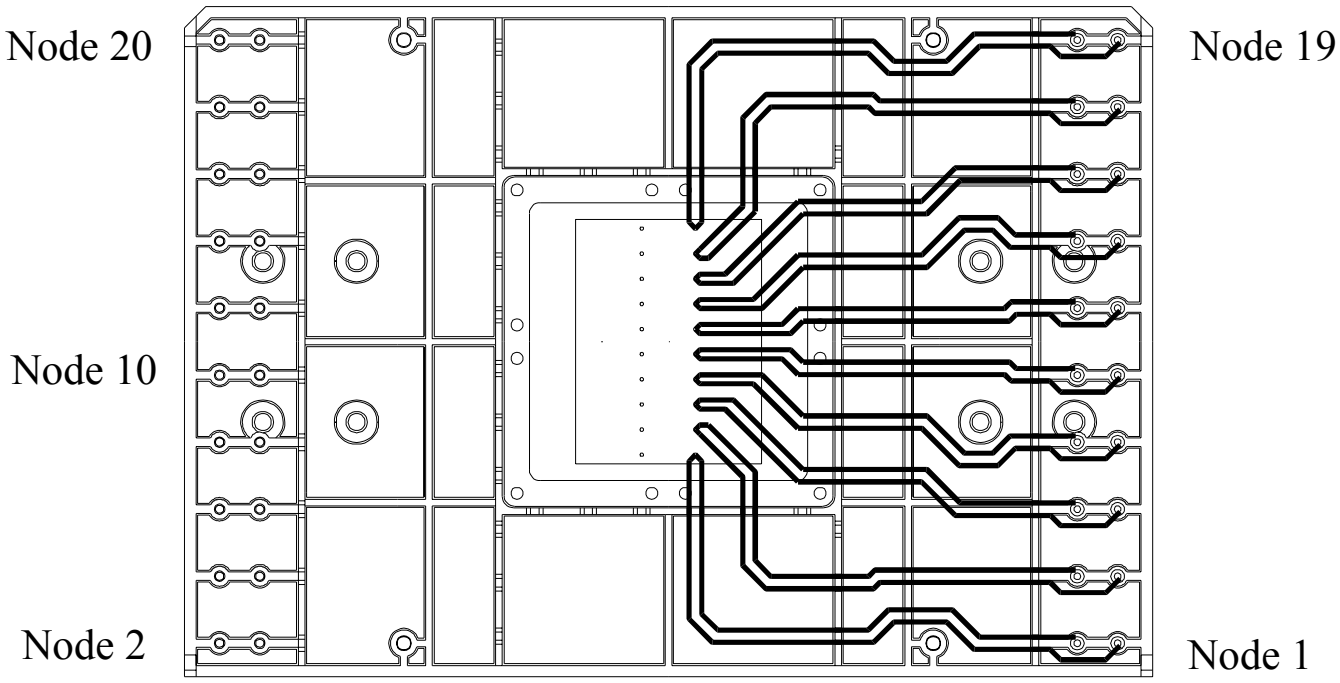
Try the assembly before cutting the rod if you are unsure of the length.

Wiring the Fixture

1. Always use Kelvin connections (i.e. separate power and sense leads) between each socket pin and the corresponding power and sense studs on the fixture plate.
2. Design the fixture so that the connections to the transformer can be made quickly and easily. For example, consider the wiring layout before starting, taking into account the high voltage and general notes below.
3. An AT Series tester can apply ac voltages up to 5000 Vrms (7000V peak) during the course of a test. Make sure that all the necessary precautions are taken for operation at high voltages:

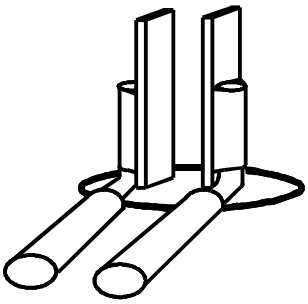
   Check that:

   - Tracks do not cross each other.
   - The likely voltages between adjacent bare contacts should not be too high (2.5mm per 1000 Volts max. is allowed).
   - All leads between the terminals should be covered with insulation capable of withstanding at least 3000 Vrms ac. They should be kept as short as possible, and the leads from one power-sense pair of studs should not touch any bare metal associated with another power-sense pair.

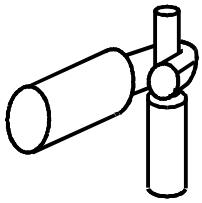


Ideal Wiring Layout from the UNDERSIDE

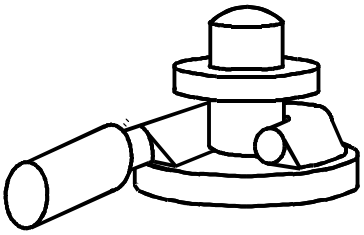
4. Start at the spring probe receptacle / kelvin pin end and lay each wire neatly into the slots in the base plate walls. Tack the wires down with adhesive and finish at the contact end. Ensure adequate solder land around each joint.



KELVIN PIN SOLDER JOINTS



PROBE RECEPTACLE SOLDER JOINT



CONTACT SOLDER JOINT

5. The kelvin pins, receptacles, contacts and recommended wire do not require pre-tinning before soldering. Other types of wire may need to be pre-tinned.

6. To ensure that the power and sense leads are not shorted, lay the wire on the outer side of the kelvin pin blades.

7. Do not attempt to shorten the kelvin pin blades. They are brittle and can be easily damaged in this way.

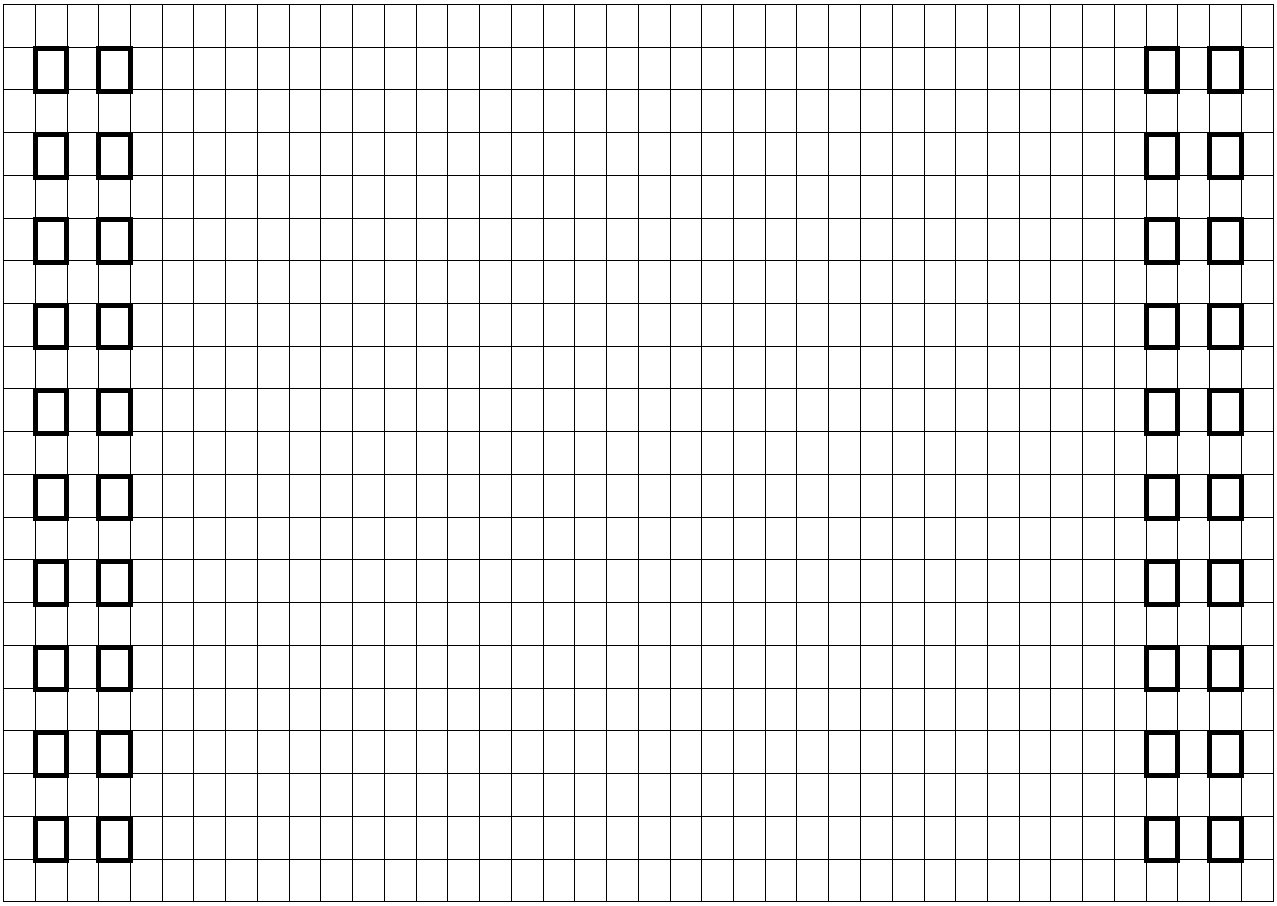
8. Use a soldering iron with a tip temperature of 250 to 275°C for no more than three second to avoid deforming a kelvin pin.

9. Non-Clean solders such as Multicore X38 are recommended.

Wiring Sketch

Make a sketch of the proposed wiring before you start. This will avoid confusion during wiring and help when programming the tester later.

Node 20 Node 19



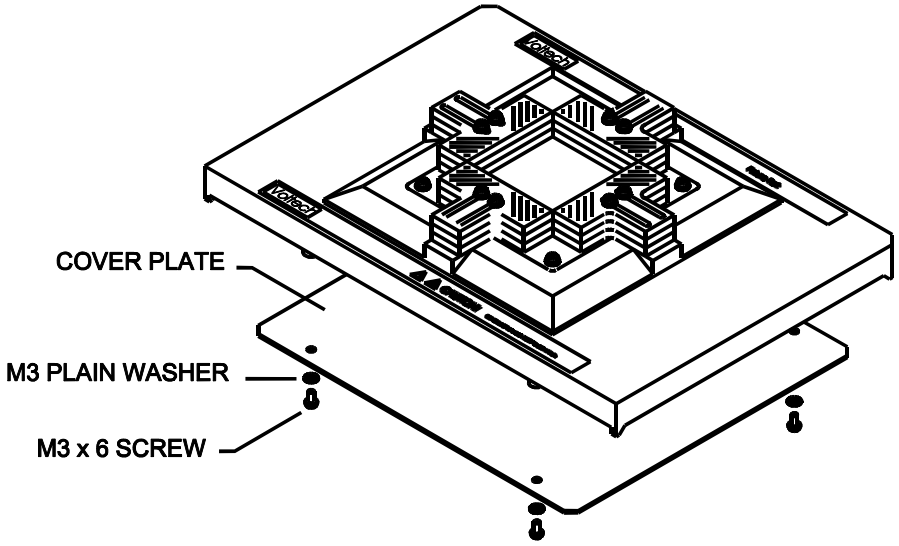
Node 2 UNDERSIDE VIEW Node 1

POWER pins are on the outside, SENSE pins on the inside.

BOTH POWER and SENSE pins must be used up on nodes that are used.

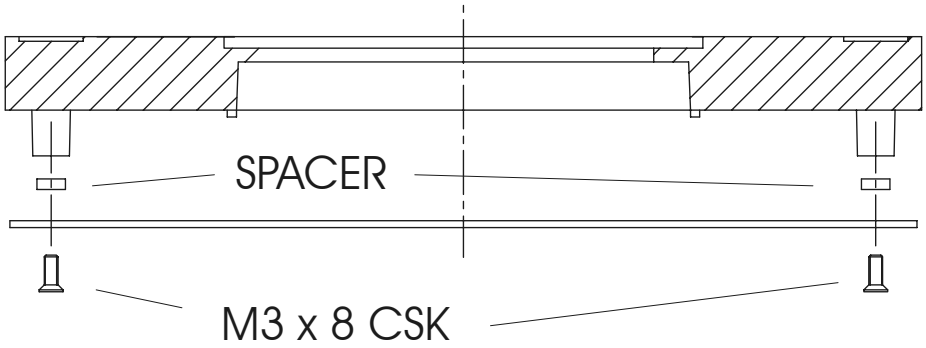
Cover Plate Assembly

Fasten the Cover Plate to the underside of the base plate with four M3 x 6 Pan Head screws and four M3 Plain Washers



USING A VOLTECH PRE-DRILLED PROBE BOX KIT

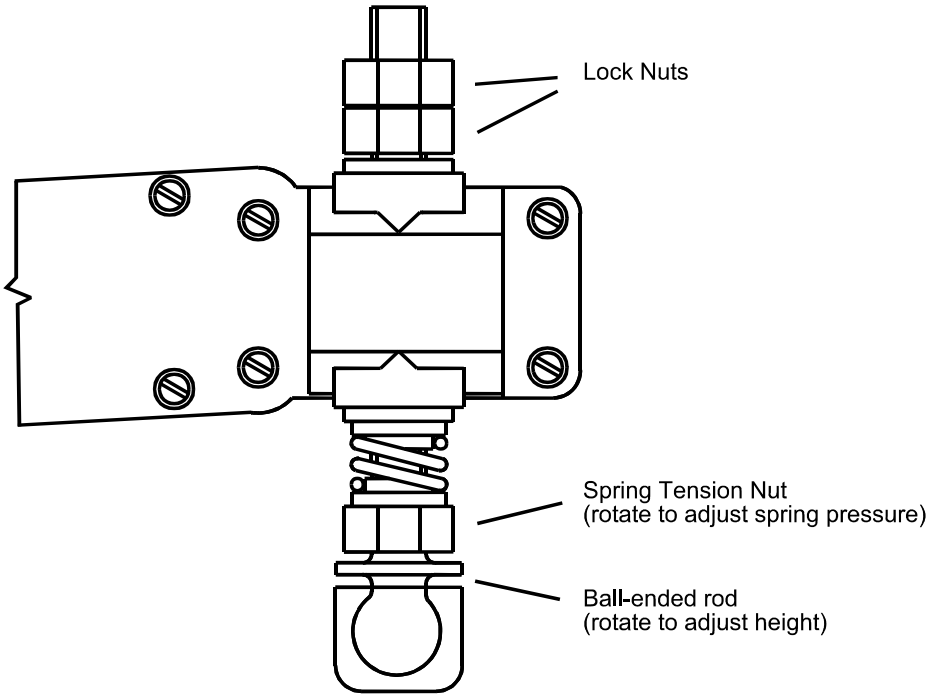
Follow the instructions above, remembering to fit the supplied spacer washers in between the base plate and the cover. Secure the interface plate using the 4 OFF M3 x 8 mm COUNTERSUNK screws supplied with the Drilled Box Kit, NOT the M3 x 6mm screws.



Cover Plate Assembly Using a Voltech DRILLED PROBE BOX KIT

Adjusting the Clamp

To optimise the connection to the transformer and minimize operator fatigue, the clamp should be adjusted to ensure adequate downward force without excessive pressure.



1. Slack of the lock nuts towards the top of the rod.
2. Loosen the spring tension completely by unscrewing the spring tension nut down to the flange of the rod.
3. Place a sample part in the fixture on top of the probes and close the clamp.
4. Rotate the rod until the transformer is in the desired testing position; this is typically 4mm of travel down from the resting position, but in any case the maximum probe travel must not be

exceeded. PCB mounting transformers would typically be forced downwards until the bobbin just rests on the interface plate.

5. Open the clamp and WITHOUT ROTATING THE ROD, screw the tension nut upwards against the spring until the spring is just under compression.
6. Screw the bottom most lock not down until it just touches the clamp and then lock the other lock nut against it.
7. Test the mechanism. If the transformer does not travel properly and make good contact increase the spring tension by two turns of the spring tension nut. Repeat this until contact is made. It may be necessary to operate the fixture and a sample part with the tester running resistance measurements to confirm that the fixture has been constructed and adjusted correctly.

7. GENERAL NOTES AND MAINTENANCE

1. Always use sockets or probes which are mechanically robust. Poor mechanical connections can affect the measurements, and hence throughput and quality of the product.
2. Use a separate fixture for each transformer type, as this can improve the testing throughput.
3. Clean fixtures, sockets and probes regularly with isopropyl alcohol. Unscrew the four screws holding the interface plate and lift out the plate to reveal the probes. In this way the fixture can be cleaned without moving the guides. Regular cleaning will maintain a high insulation resistance between contacts, and improve the quality of the connections to the transformer pins.
4. Spring Probe / Kelvin Blade replacement. With proper installation and maintenance the probes and blades can last several millions of operations before wearing out. Should it become necessary to replace any of the probes or blades, this is done by carrying out the assembly instructions in reverse. If a spring probe head is damaged or worn this can be replaced separately.

8. FURTHER HELP AND ADVICE

Further help and advice on the design, construction and maintenance of your fixture or any other Voltech product may be obtained from your local supplier or from a Voltech office:

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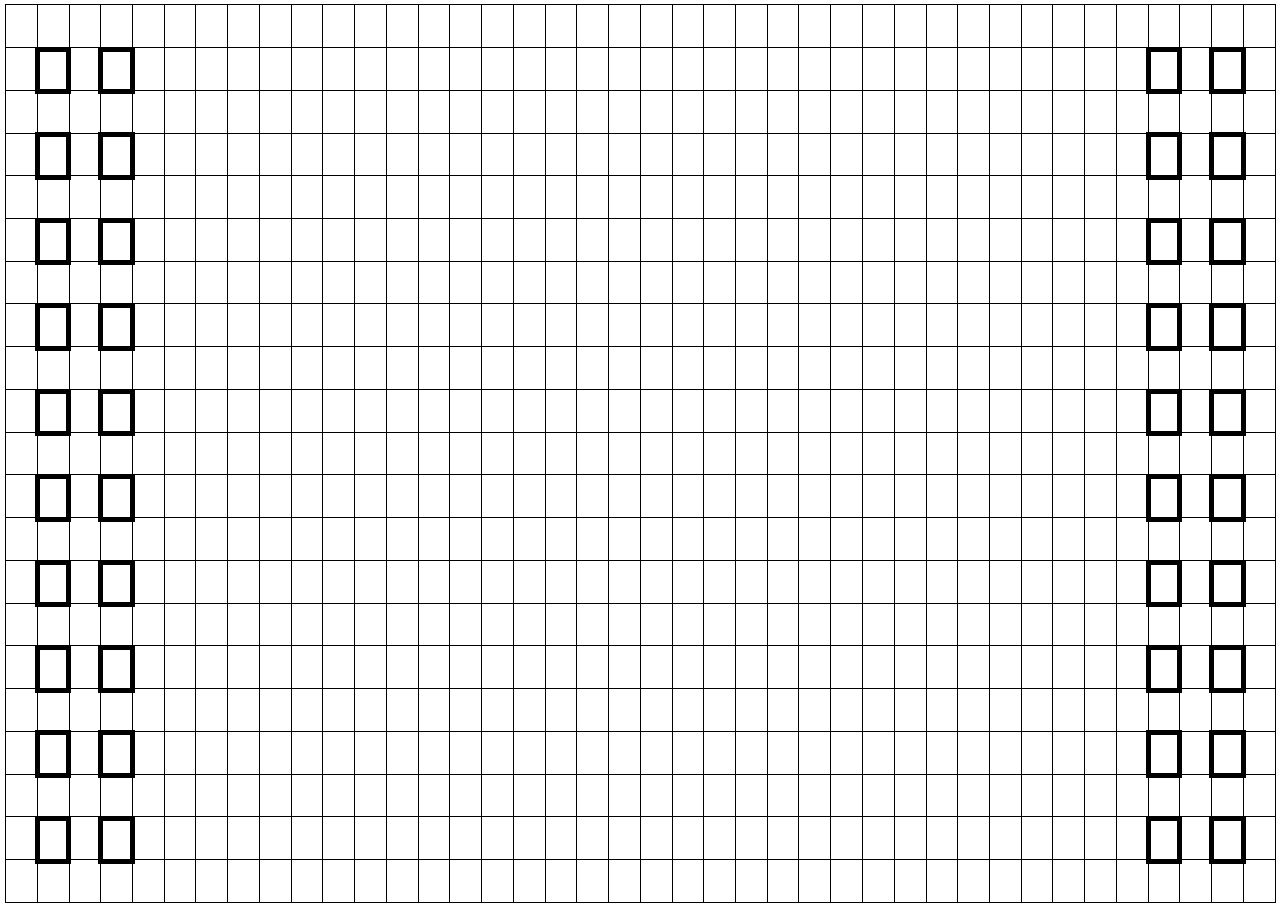
Notes:

Node 20 Node 19



Node 2 UNDERSIDE VIEW Node 1

POWER pins are on the outside, SENSE pins on the inside.

BOTH POWER and SENSE pins must be used up on nodes that are used.

Appendix A. Manufacturer's Bobbin Types

The Drilled Probe Box Kits previously described have been designed to accommodate a broad range of bobbin and pin types. The following tables identify some manufacturer's parts that we know to be compatible with the referenced Drilled Probe Box Kit.

This list is by no means exhaustive; many more manufacturer's parts are suitable for use with the Voltech kits.

Before ordering or assembling fixtures you are urged to compare up-to-date manufacturer's bobbin and pin data with the specification of the various Voltech kits.

Manufacturer	*Type*	*Description*	*Pins*	*Rows*	*Bobbin Pitch*
		RM Probe Box Kit			
		Probe Kit C			
Miles Platt, Matsushita, Siemens, & Norwe	RM	RM4	5		
		RM4	6		
		RM5	4		
		RM5	5		
		RM5	6		
		RM6	4		
		RM6	5		
		RM6	6		
		RM6	8		
		RM7	4		
		RM7	5		
		RM7	8		
		RM8	5		
		RM8	8		
		RM8	12		
		RM10	8		
		RM10	10		
		RM10	11		
		RM10	12		
		RM12	11		
		RM12	12		
		RM14	10		
		RM14	12		

Manufacturer	*Type*	*Description*	*Pins*	*Rows*	*Bobbin Pitch*
		5.00mm Probe Box Kit			
		Probe Kit A			
Miles Platt	M-Range	EI 30x5.0	10	2x5	20.0
		EI 30x10.5	10	2x5	20.0
		EI 30x12.5	10	2x5	20.0
		EI 30x15.5	10	2x5	20.0
		EI 30x18.0	10	2x5	20.0
		EI 38x13.6	10	2x5	25.0
		EI 38x20.0	10	2x5	25.0
		EI 42x14.8	12	2x6	25.0
		EI 48x16.8	12	2x6	27.5
		EI 48x20.5	12	2x6	27.5
		EI 48x20.8	12	2x6	27.5
		EI 54x18.8	14	2x7	30.0
		EI 54x25.5	14	2x7	30.0
		EI 60x21.0	14	2x7	32.5
		EI 60x25.5	16	2x8	32.5
		EI 60x33.0	14	2x7	32.5
		EI 60x23.0	16	2x8	35.0
		EI 60x34.5	16	2x8	35.0
	U-Range	UI 30x5.5	8	2x4	35.0
		UI 30x7.5	8	2x4	35.0
		UI 30x10.5	8	2x4	35.0
		UI 30x16.5	8	2x4	35.0
		UI 39x8	10	2x5	45.0
		UI 39x10.2	10	2x5	45.0
		UI 39x13.5	10	2x5	45.0
		UI 39x17.0	10	2x5	45.0
		UI 39x21.0	10	2x5	45.0
	EP-Range	EP 13			
	E/EF-Range	EF 12.6/7/4	6	2x3	10.0
		EF 20/10/6	6	2x3	10.0
		EF 25/13/7	8	2x4	20.0
		E 30/15/7	6	2x3	12.5
		E 42/21/15	12	2x6	30.0
		E 42/21/20	12	2x6	35.0
		E 55/28/21	14	2x7	40.0
		E 55/28/25	14	2x7	40.0
	U-Range	U 13.5	6	2x3	12.5
		U 25/20/13	12	2x6	27.5
	Misc	E1 42x15	10	2x5	25.0

Manufacturer	*Type*	*Description*	*Pins*	*Rows*	*Bobbin Pitch*
		0.2” Probe Box Kit			
		Probe Kit A			
Miles Platt					
	EC-Range	EC 70 (MP53)	12	2x6	50.80
	ETD-Range	ETD 29/16/10-12 Pin	12	2x6	25.40
		ETD 29/16/10-14 Pin	14	2x7	25.40
		ETD 29/16/10-13 Pin	13	7+6	25.40
		ETD 34/17/11	14	2x7	25.40
		ETD 39/20/13	16	2x8	30.48
	E/EF Range	EF 20/10/6	8	2x4	15.24
		EF 25/13/7	10	2x5	12.70
		EF 25/19/6			
		E 25x19x6 (F1238)	10	2x5	15.24
		E 30/15/7	10	2x5	25.40
		EF 32/16/9	10	2x5	25.40
		E 34x26x8	8	2x4	20.32
	U-Range	U&I 12.7x8.9x4.95	6	2x3	10.16
		U 15/11/6	4	2x2	15.24
		U 20/16/7	4	2x2	20.32
		U 21/15/7.5	4	2x2	20.32
	Misc	EI 48x10	16	2x8	27.94

Manufacturer	*Type*	*Description*	*Pins*	*Rows*	*Bobbin Pitch*
		0.2” Probe Box Kit			
		Probe Kit A			
NORWE	ETD	90635-87	10	2x5	15.24
		90636-87	12	2x6	17.78
		90641-87	12	2x6	20.32
		90642-87	14	2x7	22.86
		90644-87	16	2x8	25.40
		90755-87	10	2x5	12.70
		90755-87	10	2x5	15.24
		90755-87	10	2x5	17.78
		90756-87	12	2x6	15.24
		90756-87	12	2x6	17.78
		90756-87	12	2x6	20.32
		90761-87	12	2x6	17.78
		90761-87	12	2x6	20.32
		90761-87	12	2x6	22.86
		90762-87	14	2x7	20.32
		90762-87	14	2x7	22.86
		90762-87	14	2x7	25.40
		90764-87	16	2x8	22.86
		90764-87	16	2x8	25.40
		90764-87	16	2x8	27.94
		90770-87	10	2x5	20.32
		90771-87	12	2x6	22.86
		90772-87	10	2x5	20.32
		90774-87	12	2x6	22.86
		90777-87	14	2x7	25.40
		90778-87	12	2x6	25.40
		90779-87	14	2x7	25.40
		90780-87	14	2x7	25.40
		90782-87	16	2x8	30.48
		90787-87	12	2x6	25.40
		90788-87	14	2x7	25.40
		90790-87	16	2x8	30.48

Manufacturer	*Type*	*Description*	*Pins*	*Rows*	*Bobbin Pitch*
		0.15” Probe Box Kit			
		Probe Kit A			
Miles Platt	EP-Range	EP 13 (low profile)	10	2x5	10.16
	EC-Range	EC 35 (MP23)	8	2x4	30.48
		EC 41 (MP33)	8	2x4	33.02
		EC 52 (MP43)	12	2x6	38.10
Norwe		09785	6	2x3	7.62
		09786	6	2x3	7.62
		09867	8	2x4	15.24
		09868	8	2x4	15.24
		09985	10	2x5	15.24
		09986	10	2x5	15.24
Philips		E20/10/6	8	2x4	15.24
		E25/10/6	10	2x5	15.24

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