

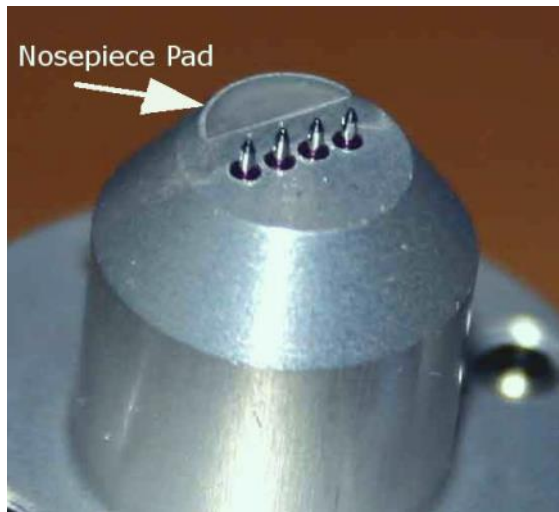
JANDEL Engineering Limited Cylindrical Four-Point Probe Head



JANDEL ENGINEERING LTD. manufactures the Cylindrical probe to be compatible with the Jandel Multiposition Wafer Probe, the Hand Applied Probe, the Microposition Probe, the Multi Height Probe, the Multi Height Microposition Probe, as well as various OEM wafer mapping systems. It can be built into custom engineered four point probing systems using the [mounting adaptor](#) which Jandel offers. All Jandel probes are built to a high level of mechanical accuracy. Specifications for radii, spacing, and planarity are verified by video inspection system and optical interferometer. Loads are verified by electronic force gauge. Each probe is fitted with both an upper and lower jeweled needle guide. Additional information about probe quality can be found in the [Jandel probe head application notes](#).

The Cylindrical probe is available in [a version usable in a vacuum environment](#). In it's standard configuration it can withstand temperatures from 77K up to 120°C, and it is available in a modified version for use at temperatures up to 200°C in an oven (300°C on a hot plate). It has a 1" diameter body and is 1.9" high (25.4mm x 48.5mm high). Weight is 40 grams.

PROBE SPACING	Very close 0.500mm & close 0.635mm. Standard 1.00mm. Wider 1.27mm & 1.591mm 0.500mm=20 mil, 0.635=25 mil, 1.00mm=40 mil, 1.27mm=50 mil, 1.59mm=62.5 mil
TOLERANCE	+/-0.01 mm
ARRANGEMENT	Linear or Square array
NEEDLES	Solid Tungsten carbide Ø 0.40 mm (Ø 0.30 mm for close-spacing) 45 degree included angle, phosphor-bronze connecting ligament
SPECIAL	Jewel bearing probe guides
RADII	12.5 µm min. to 500 µm max. polished with 2 µm diamond
RETRACTION TO INSULATING PAD	0.5 mm
PLANARITY	+/- 0.025 mm or better
LOADS	10g - 250g. Default 100 gram spring load
LEADS	4-way cable Teflon insulated (screened on cylindrical)
ELECTRICAL LEAKAGE	10 ¹³ ohms resistance between needles at 500 volts



Jandel Cylindrical Probe Nosepiece Pad

The nosepiece pad on Jandel four point probe heads is made of acrylic. The pressure for each tip is individually set using a custom made electronic force gauge to insure an accurate tip pressure, or "load". The process of adjusting each probe includes lowering the probe head until the nosepiece pad has touched the material under test. At this point, where each tip has fully retracted into the probe body, the factory set spring load is set. For example, if a probe is to be set to 100 grams, each tip will be exerting 100 grams of force at the point where the probe head has been lowered until the nosepiece pad has touched the material.



The probe to the left has been fitted with a jeweled nosepiece pad instead of the acrylic pad. The standard operating temperature range for the Cylindrical probe is from LN₂ temperature (77K) up to approximately 120°C. For a nominal fee, minor modifications can be made which include the use of high temperature solder and replacing the standard nosepiece pad with a jeweled pad which increases the operating temperature up to 200°C, for use in an oven. The probe can withstand up to 300°C if used for short periods of time on a hot plate in the open air.

Small Shroud

The Jandel Cylindrical probe can be supplied with the **Small Shroud** which is fitted onto the nose-piece. It is designed to help steady the probe when applying the probe head by hand.

Small Shroud Mounted onto the Nosepiece of a Cylindrical Probe



Each shroud is hand fitted to match the nosepiece it is supplied with. The small shroud should also fit other probes of the same type (e.g., you could move it from one Cylindrical to another, but not necessarily from a Cylindrical to a Compact). The shroud is adjusted so that it fits the height of the pad on the probe it is supplied with - therefore if moving it from one cylindrical to another there may be a small change in load applied if the two probes have different pad styles or pad thicknesses, or if the tip retraction distance for one probe was different from the other. Probe tip retraction for the Cylindrical probe is standard at 0.5mm which is measured at the point where the pad touches the material being measured. This is for informational purposes as it really shouldn't affect day-to-day usage.

Custom Nosepieces



Jandel can supply customized nosepieces to satisfy special requirements. Shown here are an acrylic nosepiece, a beveled nosepiece, and a nosepiece with a rectangle probe tip array instead of the usual linear or square array.

Manufacturing & Probe Specifications

The work involved in building a Jandel four-point probe head is similar in some ways to horology (watch making) in that it is laborious, meticulous, and time consuming. The founder of Jandel Engineering is, among other things, a trained horologist. Jandel's probe production department consists of 6 individuals, with final assembly conducted by four senior employees, three of whom boast more than 15 years experience. The process involves grinding and polishing of the probe needles to a specific radii, precision machining of various parts, the installation of tiny jeweled bearings as probe guides, and meticulous assembly. Final testing involves the use of calibrated measurement instruments including an optical interferometer, a video inspection system, and an electronic force gauge. All Jandel probe heads meet stringent accuracy requirements for tip radii, tip spacing, tip planarity, and spring loads.

General Specifications

Jandel Probes are made almost entirely of non-magnetic materials except for the piano wire springs. Most of the probes have an aluminum body, nosepiece, and upper guide. The tips are tungsten carbide and include jewel bearings, i.e. upper and lower synthetic ruby needle guides. There are a few tiny stainless steel screws used. The standard temperature limit for the Cylindrical probe is +120°C. Jandel offers a high-low temperature version of the Cylindrical probe which has a jeweled nosepiece pad in place of the standard acrylic pad. This version can withstand temperatures from LN2 temperature (77K) up to +200°C

Accuracy

Jandel Probes are built to a high level of mechanical accuracy. Tip spacings are within a 10 micron tolerance and spring loads are set to within +/- 5 grams. Tip radii tolerance is quoted at 10%, however, the most common radii such as 40 and 100 micron are typically within 5%.

Spacing

Jandel offers probes with "very close" needle spacing (0.5 mm) and "close" needle spacing (0.635 mm) in several models including the Cylindrical Probe, Six-Way Probe, Four-Pin Probe, and Cartridge with Lead. Probes built with 0.5mm tip spacing are available with spring loads of up to 100 grams only. Tip spacings are available up to 1.591mm. Tip spacing is measured from the center of the contact area. To measure the tip spacing, the

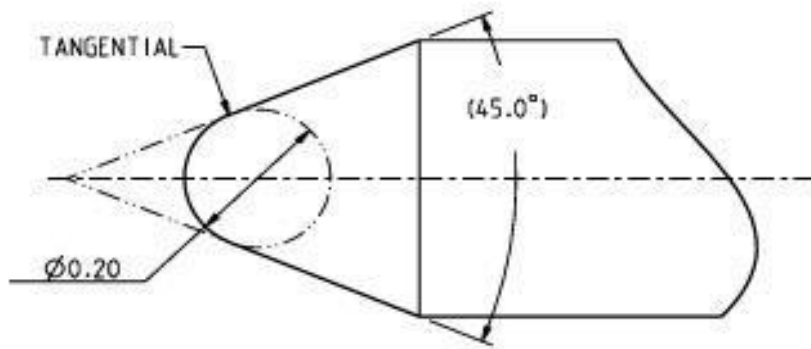
Spring Loads

Jandel uses a custom-made electronic force gauge to set and check the loads for each needle individually. The Cylindrical probe, which is one of several probe body styles that Jandel offers, can be supplied with 10 grams up to 250 gram loads. Jandel can provide a recommendation for spring loads and other probe specs by providing to them a detailed description of materials to be tested.

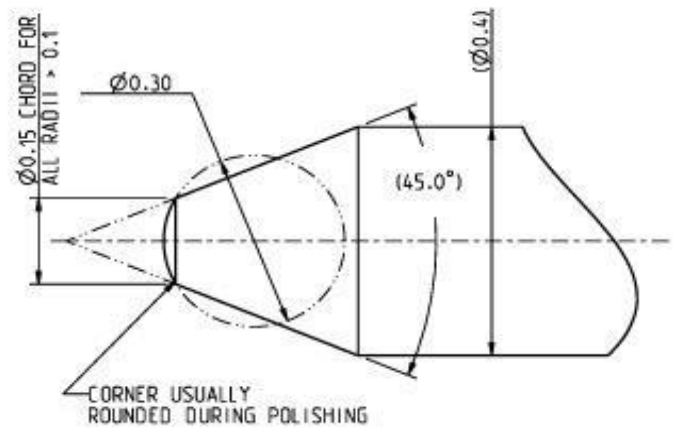
Tip Radii

Radii of 100 microns or less are applied as a whole radius and larger radii are applied to a 150 micron flat. In some instances 500 micron radii can be applied to the whole of the tip, although the needle is only 400 microns diameter so this is not quite a 'full' radius. The needle material is tungsten carbide and therefore very hard, however repeated use will eventually produce 'flats' on the end of the radii. This will not necessarily prevent the probe from working, and erroneous results are the best guide to when a probe head is no longer working at an optimum level. Jandel has never been able to find a probe tip supplier that can provide tips that meet their requirement for radius accuracy. Jandel hand-grinds all of their tips on a precision watchmaker's lathe, and then makes fine adjustments to the tip shapes using diamond files and diamond paste.

Tip Radii continued



RADIUSING DETAIL FOR
100µ RADIUS OR SMALLER



RADIUSING DETAIL FOR
150µ RADIUS OR LARGER

Tip Material

Jandel Engineering offers tungsten carbide probe tips only as this is the most reliable and sturdy material for use with their probes.

For further information, contact:

Bridge Technology
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Email: sales@bridgetec.com
www.four-point-probes.com



One of two video inspection systems that Jandel uses