

An introduction to gut strings on the lute

Historically, lutes were strung with gut, which gives a very different sound and feel from today's more frequent nylon stringing. Lutenists wishing to hear their instrument's true voice should try gut stringing, and the following guide explains how to do this.

Our first step should be to work out whether it is possible to string our lute in gut at the pitch at which we want to play it. All gut strings break at more or less the same pitch on any given string length, irrespective of their diameter; only the breaking tension varies. This is counter-intuitive but true, which gives us a constant factor from which to calculate a working pitch. Convert the string length of your lute, (measured between the inside faces of bridge and nut), into metres: e.g., for a 60cm g' lute the number will be 0.6. Divide 240 by this number. The result is the frequency in Hertz of the highest note to which we can tune a gut string at that string length. With the best quality strings it is a conservative estimate, leaving a safety margin of at least a semitone. For reference, the frequencies of the commonest top string notes are: a' above middle c': 440. g' sharp - 415; g' - 392; f' sharp - 370; f' - 349, e' - 329. Our 60cm lute gives us the frequency 400, or a rather sharp g'.

If the sums indicate that our stringing ambitions are realistic, we now need to work out exactly which strings to order. The manufacturing processes and terminology used for modern gut strings are often not the same as those used for historical gut strings, of which we have little reliable information. This guide follows the straightforward terminology used by Mimmo Peruffo, who has pioneered the recreation of various historical string types, which are now widely used by professional players. Other manufacturers have their own string types and terminologies, but the basic principles are few, and present no problems once we have understood the criteria by which strings are chosen.

Treble strings Treble strings are the thinnest, tightest and most-used strings on a lute, and require the maximum possible tensile strength. Therefore they are always made from low-twist plain gut, which simplifies selection. We just need to know the gauge (thickness) and length we need, and then choose a finish. Gauges and lengths are discussed at the end of this leaflet. Finishes mean oiled versus varnished, and rectified versus unrectified. Historically, only unrectified oiled strings were available. Oiled strings are cured in oil during manufacture (the finished strings do not feel oily!) and are considered by most players to have a better sound than varnished strings. However, varnished strings are less affected by changes in climate, (which affect tuning stability) and are more resistant to extreme skin chemistry, though some players find that their fingers squeak on the varnish. If your sweaty fingers turn nylon string windings black or green, you may be better off with varnished gut, otherwise try the oiled strings.

Gut is a natural material with inherent irregularities. A finished string which is very irregular along its length will not fret in tune, therefore most strings are rectified mechanically during manufacture, to remove these irregularities. Some surface fibres are cut during this process, so the resultant string is a little weaker, but because it is evenly round along its length it frets in tune. Unrectified strings are polished a little

by hand, but retain some irregularity. They vary in their trueness; some may not fret well in tune, but they are stronger than rectified strings and last longer, and their tone and sustain is unmatched by any other kind of string.

Mid-range strings For mid-range strings (the 3rd-4th courses of renaissance lutes, the 3rd-5th courses of baroque lutes) we have a choice of plain gut or 'Venice' strings; the latter are indicated with a 'V' after the gauge number. Plain gut strings in these gauges are made from many strands of gut, which are twisted more than the thinnest strings, and are therefore called 'high twist'. This is to give them flexibility, which in turn gives better intonation: if the strings are too inflexible, the lateral displacement caused by the fretting of notes pulls these notes sharp. Venice strings are made with even more twist and are therefore more flexible, have a brighter sound and fret better in tune than plain gut. They are more expensive but are extremely durable, and their superior qualities are clearly audible in gauges from about 0.8mm upwards, particularly on fretted courses. For thinner gauges and the upper octaves of unfretted bass courses, ordinary high-twist gut is fine. We have the same choice of oiled or varnished finish, but the strings are always rectified so we do not need to specify this.

Bass strings Here we have a lot of choices. On a few instruments such as the 6 course lute, Venice strings will work well right down to the bass, producing a focused sound with longer sustain than other plain gut strings. If we need lower notes on a relatively short string length, we will need heavier strings, and here we meet the big problem of stringing a lute in gut. We want bass courses with a strong focused sound, but we cannot merely keep increasing the thickness of the strings to achieve lower notes. A very thick plain gut string sounds dull, is too inflexible to fret in tune, feels cumbersome under the fingers, and would not fit through the bridge and peg holes of historical lutes. Assuming that such strings already incorporate the maximum possible twist, the only option is to increase the weight of the strings in some way. Gut can be made denser by impregnating the raw material with metal salts (loaded strings), or a string can be made heavier by wrapping a gut core in a metal winding (wound strings). Loaded strings are the closest modern equivalent to the red basses seen in many 16th and early 17th century paintings. They are red-brown in colour, with a smooth, shiny finish, and are significantly thinner than their plain gut equivalents. They are easy to pluck and fret, have a firm, focused sound, and sustain a little longer than a Venice string. They are the best choice for courses which do not need to be fretted, e.g., the lowest courses of baroque lutes. Because the gut absorbs metal salts unevenly, some may suffer from intonation problems when fretted.

Wound strings were not available until the 1660s, and there is no evidence for their widespread use until the 18th century. Historical strings were 'demi-filé' - open-wound with gaps between the windings (literally 'half-wound' with gaps as wide as the diameter of the wrapping wire), or close-wound with the winding entirely covering the core. A close-wound string is heavier than a half-wound string of the same gauge, and therefore best for the lowest basses and/or shorter string lengths. The winding may be of silver, for a brighter sound, or copper for a warmer sound. These strings have a focused sound with a shorter sustain than modern wound nylon strings.

Working out gauges and lengths To work out gauges we need to know a lute's

string length(s), measured between the inside faces of the nut and the bridge, the notes to which it is tuned (g', d', a, etc), and its pitch - A440, A415, etc. Note also whether each course is single or double, octave or unison strung. Ideally we need the tension of each string as well. String manufacturers Aquila Corde Armoniche (www.aquilacorde.com) offer an online string calculator on their website. If we type this information into the appropriate spaces, it will work out the gauges we need. Note that the different types of string are all calculated by their plain gut equivalent, so if we work out the gauge we need in plain gut then decide to have a Venice or loaded string instead, we can just keep the same number and add 'V' for Venice or 'C' for loaded. It is normal practice to reduce the tension across the lute as the strings become thicker; this gives a feeling of equal tension, which is desirable. A single top string should be appreciably tighter than the individual strings of the (double) second course. From the second to the fifth courses, the tension should be slightly reduced with each successive course. From the fifth course downwards we can use the same tension on each course. If you do not know your string tension it can be worked out from a lute's current stringing, irrespective of material, using the same online calculator and string conversion charts. Plain nylon string gauges (NOT fluoro-carbon) can be converted to gut gauges by multiplying them by 0.91: e.g., a nylon string of 0.50mm diameter is equivalent to a gut string of 0.45mm. If you do not know your lute's current stringing details, some specimen stringing lists are supplied at the end of this leaflet, for some common lute types at average tension. Those who do not have access to the web can obtain a string calculator cheaply from Bernd Kürschner (Obere Waldstrasse 20, D-65232 Taunusstein, Germany. Tel. +49 (0) 6128-6910). If you are still unable to work out the tension, most string dealers and makers will work it out for you: keep this information in the case with the lute. To work out the length we need to add together the sounding length of the string (bridge to nut), the length from the nut to the appropriate peg, plus around 10cm to allow for tying on the bridge and winding on the peg. The standard 120cm length is adequate for almost all lutes except archlute and theorbo diapasons.

Fitting and caring for gut strings Be careful not to kink strings as you fit them: such kinks are weak points and may affect the sound. Otherwise, gut strings are easier to fit than nylon strings because they are less slippery. They will usually grip themselves easily on the bridge, negating the need for multiple twists, knots or burnt nodules on the string ends. The easiest way to attach thin strings to the peg is to push about 2cm of string through the peg hole, twist the short end around the main length a few times, and then wind the string up on the peg. To avoid possible string jams and breakages, it is advisable to wind the string so that it does not press against the wall of the pegbox.

The thinnest strings will last longer if we detune them by about a tone between playing sessions. They settle to pitch very quickly when they are tuned up again. Make sure that nut grooves are smooth and well polished, otherwise strings will fray at this point. Any hairs which sprout from the surface of a string should be cut off close (a nail clipper does the job quite well) because they deaden the sound of a string and may cause further unravelling. We can slightly improve a string's performance by first tying it on the bridge, rolling it between our fingers to introduce more twist (it must be rolled in the direction of the existing twist), then fixing it to the peg. The life of an unvarnished gut string may be prolonged by a very light coating of almond oil. Put a spot on your index finger and thumb and run the length of the string between

them: it is a non-siccative oil so it should be imperceptibly fine.

With thanks to Ivo Magherini and Mimmo Peruffo for feedback and assistance.