

ELONGATION PROPERTIES OF THE FOUR MOST MAJOR STRING MATERIALS

Naturally, each group of material will show some variation in results, as not only the grade and purity of material will make a difference, but also the method of manufacture, and particularly with resin bonded multi filament, the density of the construction.

OBSERVATIONS

- The low elongation values of Aramid make it essential that string knots are tight and secure, as a little give or slippage would result in tension loss.

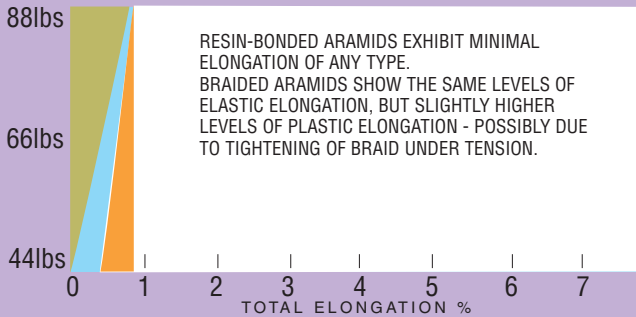


Figure 4: Range for Aramids (resin bonded)

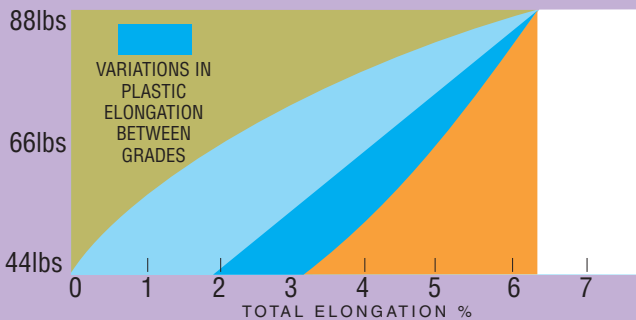


Figure 5: Range for natural guts tested

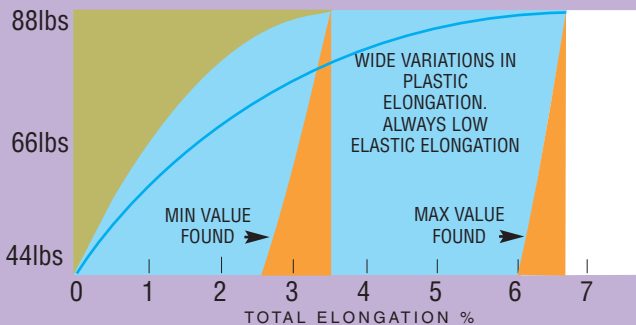


Figure 6: Range for polyesters

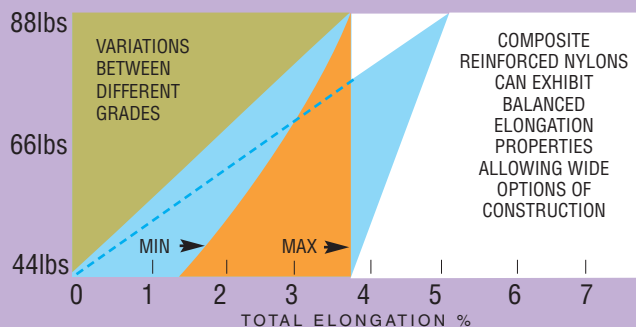


Figure 7: Range for composite reinforced nylon strings tested.

- These values for natural gut relate to top quality machine produced strings. Those produced by predominantly manual methods may show higher plastic elongation.

- All grades of Polyester show high levels of plastic elongation and low levels of elastic elongation, but there is a wide range of values between different commercial types.

- Only nylon strings reinforced with composites were tested and the balanced elongation properties and relative ease of manufacture allowed more construction design options than the other string materials.

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PLAYING PERFORMANCE PREDICTED BY THE ELONGATION PROPERTIES OF THE 4 MAIN STRING MATERIALS, MEASURED AGAINST ACTUAL PLAYING PERFORMANCE

RESIN BONDED ARAMID (Fig 4)

Marketed by Tennis Tech under the name PROKEV. The low elongation values make it ideal for resin bonding multi filament constructions.

Predicted Performance: The almost total absence of plastic elongation and minimal elastic elongation suggest this is an extremely stiff string with great stability (and durability) which would limit its use for main string only.

Actual Playing Performance: Used for main strings only - great resistance to tension loss and maximum durability.

Recommended For: Hard hitting players on all surfaces and especially for those who do not want the expense or inconvenience of frequent re-strings. The great stability of Aramid allows very thin diameters to be used, thus enhancing feel. When aramid strings are used for the mains the cross string selected should match as closely as possible its stability. Both natural gut and composite reinforced nylons are logical selections, but not polyester.

Cautionary Notes: Not recommended for ultra light, ultra stiff racquets, or for those players susceptible to wrist, elbow or shoulder injury problems.

POLYESTER - MONO FILAMENT (Fig 6)

Marketed by Tennis Tech under the name MATCH PRO. The high plastic elongation of all polyesters makes its production as a multi filament not only difficult but also to no advantage, as plastic elongation would be increased.

Predicted Performance: Very high plastic elongation with low elastic elongation suggests a very stiff string with moderate stability and good durability, the stiffness of which would just about allow its use in both mains and crosses.

Actual Playing Performance: Used for main strings in many instances and in others for mains and crosses. The top players overcome the stability aspect by cutting out strings long before breakage is imminent, eg often after only an hour or so of play. A club player can of course go longer. As the larger diameters stretch less, stability increases with diameter used, but feel decreases.

Recommended For: Hard hitting players on high bouncing or clay surfaces, who wish to prevent breakage in a specific time period when the string stability is known.

Cautionary Notes: Not recommended for ultra light, ultra stiff racquets, or for those players susceptible to wrist, elbow, or shoulder problems. Stringing techniques, such as double pulling, can increase stability but reduce elastic elongation which then increases stiffness even further.

NATURAL GUT - MULTI FILAMENT (Fig 5)

Marketed by Tennis Tech under the name CHAMPIONSHIP GUT, the elasticity of the fibres permits resin bonding to ensure increased robustness of this more fibrous material.

Predicted Performance: The high elastic elongation of Natural Gut combined with a high ratio of elastic to plastic elongation, ensures great stability, great feel and comfort, but the mandatory multi filament construction and high elasticity will limit durability.

Actual Playing Performance: Great feel, comfort and stability, but durability for main strings may be a problem for many types of players.

Recommended For: Hard hitting players on all surfaces when the expense and inconvenience of frequent re-strings is not a problem. The durability for club players may, in many instances, be acceptable, particularly for those with wrist, elbow or shoulder problems who are seeking greater comfort.

Cautionary Notes: The hygroscopic nature of Natural Gut will lead to loss of stability and durability when used in damp atmospheres. Stringing thinner diameters at high tensions, eg above 62 lbs, will reduce elasticity and affect feel and comfort.

NYLON - REINFORCED WITH COMPOSITES (Fig 7)

Marketed by Tennis Tech under such names as SYNTHETIC GUT, SYNTHETIC GUT PLUS, TENNIS POWER, FIBRE POWER, GUTECH PLUS, TOURNAMENT SYNTHETIC, PRO NYLON, the overall properties of the material lends itself to a diverse range of resin bonded constructions.

Predicted Playing Performance: Figure 5 clearly shows that composite reinforced nylons can achieve high elastic elongation with a good ratio of elastic to plastic elongation. Thus, depending on grade of material and string construction, nylon strings can be engineered to produce a favourable combination of stability, durability and feel.

Actual Playing Performance: Extensively used by players at all levels, the top players using designs engineered towards stability, while club players use designs combining stability with durability. For those players looking for greater feel or with wrist, elbow, or shoulder problems, the multi filament varieties are recommended.

Cautionary Notes: Not the durability of Polyester, but greater stability. Not the durability of aramid, but can approach its stability - even in multi filament form. Not quite the feel of Gut, but greater durability. All round properties allowing a variety of design options which cannot be matched by any alternative material.