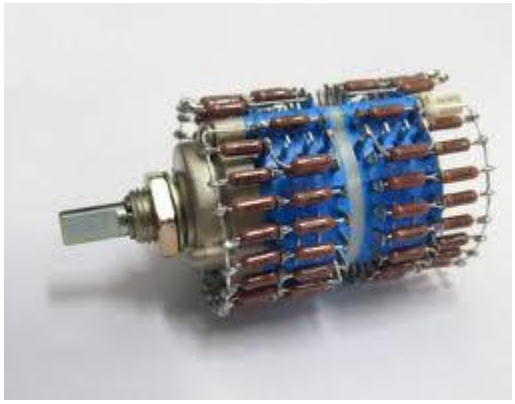
A 100% passive attenuator unquestionably produces the cleanest and purest line stage of all. "

The case against resistor based attenuators

Entry level passive preamps usually refer to resistive passives which suffer impedance mismatches and concomitant frequency response aberrations depending on setting and cable load and impose large impedance values with additional resistance in part of accomplishing attenuation.

A passive attenuator fabricated out of discrete resistors, or a traditional carbon potentiometer adds significant resistance to the source impedance, resulting in the source output impedance being a lot higher with the consequence of added noise, lower damping factor and limiting the frequency bandwidth.



It requires the source to provide the power to drive the volume control's resistance which can result in currents as high as 2mA

By comparison, transformer-based attenuation with its electromagnetic coupling does not rely on the addition of resistance. The transformer itself has very high impedance across the audio band. Accordingly, very little of the source's output power is lost and only the very low winding resistance appears in series with the source prior to the preamplifier's output.

In addition a transformer has a low DC resistance at both input and output which means that any noise is easily bypassed to the signal ground, which is 10 times better than a resistor passive attenuator

Ultra high-end passives may use a fancy stepped attenuator for volume control and may also provide function switching for accommodating multiple inputs. Some passives, however, include no output buffer.

That is a bad thing.

Simply inserting a stepped attenuator or potentiometer in series with the signal path without an adequate buffer can lead to serious frequency response deviations due to the RC low-pass filter effect of the passive's output impedance and any cable capacitance. If you are mathematically inclined, the formula for determining the -3dB point for an RC filter is 1/6.28RC, where R equals the source impedance in Ohms and C is the capacitance in Farads.

The example given is for a 100 KOhm pot set at medium position, which results in a 50 kOhm resistance in series with the signal.

Quoting specifics: "With a 300pF cable or input capacitance, this situation leads to an attenuation of - 3 dB at 11 KHz" and "The lower you go with the volume setting, the narrower the bandwidth becomes right in the audio band."

Some calculation: "So let's talk volume control. We are sure that over 99.99% of audio preamplifiers out there use a conventional potentiometer (pot) for volume control.

Carbon types used to dominate the scene until about 15 year ago when conductive plastic pots became popular and the latter have by now become an industry standard.

The benefit of replacing plastic type volume control to stepped attenuator is obvious! However, the accuracy of tracking and the quality of selector switch plus low noise resistors can reduce the signal loss to some degree.

Moreover the regular stepped attenuator featuring resistor type fails to offer impedance matching over plastic volume control.

That's why at high attenuation level (low signal out, low listening level) the bandwidth of such volume control is very poor and the bandwidth is not constant over any switch position

The case for Transformer attenuators

The MMM icOn overcomes these issues by using transformer attenuation which has a much higher impedance resulting in a very low current (typically 100 x lower than a resistive attenuator)

By using transformers the source only needs to drive the load and cables connecting to and from the passive preamplifier.

However, as the TVC's attenuation is increased (preamplifiers in most systems end up cutting the signal by 20dB or more at all times), the output impedance rapidly falls to very low values. This in turn translates into much improved ability to drive a load or cable.

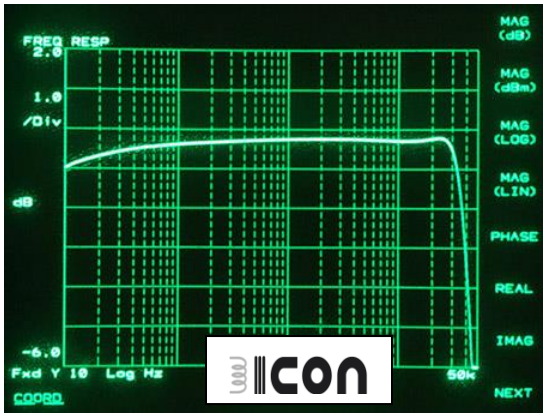
In fact, a transformer simply takes the drive ability of the source and passes it through with either a slight decrease over the source when any significant attenuation level is used. The use of transformers dramatically improves on the ability of the passive preamplifier to drive cables (and loads) compared to traditional designs.

In addition, the use of transformers will actually improve the ability of the source to drive its cables as well, which explains the experiences of senior audiophiles who found the use of the TVC to be a substantial improvement over using no preamp at all."

The case for icon

The heart of any high end passive attenuator control is the multi-tapped transformer that is used to attenuate the signal. Get this wrong and you have a poor quality result. Get it right and what you hear is magic

The bespoke small signal transformer used by icOn has a very high permeability (< 1000H) with very low loss and excellent linear frequency response, which are arguably superior to all other similar transformers available on the market on account of the highly sophisticated manufacturing technique.



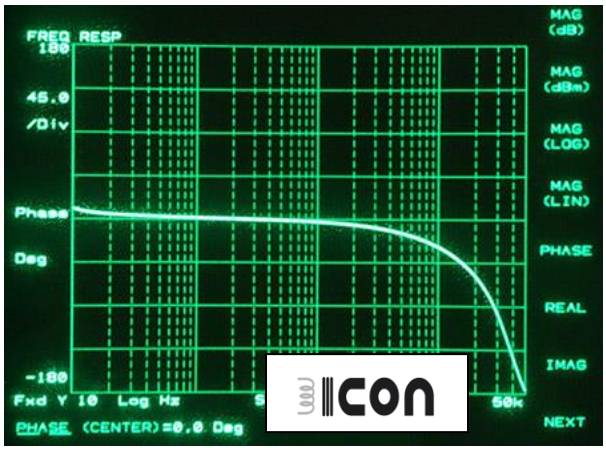
From 10Hz to 35,000Hz the frequency response is only -1dB deviation from 1KHz reference point. Source impedance is 12K ohm, load impedance is 10K ohm with a series primary connection.

The core of our transformers uses a special Nickel alloy which provides highest permability (u) with lowest coercive force. This results in a core which is better by more than 50-100 times in terms of magnetic induction, which means

- lower winding resistance
- lower inductance
- lower winding capacitance
- lower insertion loss

benefits of icon transformers

- lower signal loss
- wide frequency response at any attenuator setting
- very low output impedance



all of which are beneficial for achieving an excellent audio performance.

Remember

Music Matters Most

The winding technique for our transformers produces a very smooth phase response thus ensuring superior phase behavior throughout audio spectrum. Our transformers do not go out of phase anywhere near or close to audio spectrum.