Chain Maille Rings

Gauges, Sizes and AR (Aspect Ratio)

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Chain Maille Rings and Jewelry

Chain maille (also sometimes called *chain mail*) is an ancient form of weaving with metal rings. Most often associated with medieval armor, it's also fantastic for jewelry – which is the focus of this tutorial.

While it looks complicated, many of the weaves (as the designs are called) aren't that difficult to perform. That is, as long as you know the correct aspect ratio (AR).

The *what*?

AR is the relationship between the inner diameter (ID) of a jump ring, compared to the wire gauge that the jump ring is made from. The exact formula is ID / WG = AR

So, you divide the inner diameter of the jump ring by the wire gauge, and you end up with the aspect ratio. Simple enough, right?

The challenge is knowing what the ID is for a particular jump ring. For example, if you go jump ring shopping, you'll most often see the outer diameter (OD) listed, along with the wire gauge. Fine and dandy, but that doesn't help when it comes to figuring out the AR on the fly!

OK, so you know more or less how to calculate the AR of jump rings, but why does it matter? It's because each chain maille weave has ARs where it looks best. Try making it with a lower AR and the rings might not go through each other. Too high an aspect ratio and your weave may look floppy.

Some weaves have a wide range of ARs that can be used; for example a 4-in-2 weave can be made in almost any ratio.

On the other hand, some weaves – jans pind is an example – have a very narrow range. Move out of that range and the weave no longer works.

When you get your rings, it's a good idea to label them with the gauge, AR and diameter (ID or OD). Noting the metal is good if you have different kinds. You might also consider noting where you bought the rings, so you know where to go back when you need more.

So, here's a handy-dandy guide for you to use, to figure out the AR when all you know is the jump ring OD and the wire gauge.

AR by Gauges and Sizes

Here are some common combinations of wire gauge, diameters and AR. This little chart is useful when you go shopping for jump rings, and you only have wire gauge and diameter to go on.

Wire Gauge (AWG)	Outside Diameter (MM)	Inside Diameter (MM)	Aspect Ratio (Rounded)
14	8	4.76	**2.9**
14	9	5.76	**3.5**
14	10	6.76	**4.2**
14	11	7.76	**4.8**
16	7	4.42	**3.4**
16	8	5.42	**4.2**
16	9	6.42	**5.0**
16	10	7.42	**5.7**
16	11	8.42	**6.5**
18	5	2.96	**2.9**
18	5.5	3.42	**3.4**
18	6	3.96	**3.9**
18	7	4.96	**4.9**
18	8	5.96	**5.8**
18	9	6.96	**6.8**
20	4	2.38	**2.9**
20	4.5	2.88	**3.5**
20	5	3.38	**4.2**
20	5.5	3.88	**4.8**
20	6	4.38	**5.4**
22	3.5	2.22	**3.5**
22	4	2.72	**4.2**

Little About Wire Gauges

If you're not familiar with wire gauges, the lower the number, the thicker the wire. The gauges most often used for jewelry are 16, 18 and 20. The gauges of 14 (really thick) and 22 (really thin) aren't used nearly as much. Part of it is because 14 gauge is thick and a bit difficult to manipulate, while 22 is thin and easy to deform. However, both sizes can be useful, which is why I have some listed on the chart.

When it comes to making jewelry, make sure you are getting gauge as measured by the AWG (American Wire Gauge). When it comes to sterling silver, silver filled, karat gold and gold filled, most likely you're getting AWG measurements.

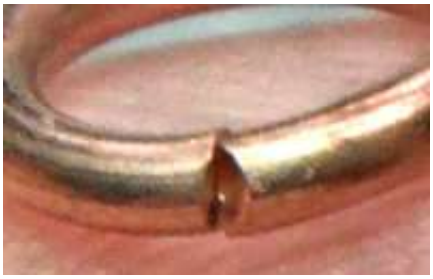
There's another measurement is SWG (Standard Wire Gauge), which tends to be thicker. So what is 18 gauge in SWG is more like 17 gauge in AWG. You're more likely to find this set of measurement used for steel, aluminum, copper, brass and titanium. SWG is more often used when working rings for armor and/or medieval wear.

In the photo to the right, you can see the difference in the two. Both are labeled as 18 gauge; the copper is SWG and the gold-colored is AWG.

However (and you knew there was a "however"), you can also find copper, brass and aluminum in the AWG measurements. You'll find generally find these in places where you buy jewelry supplies.

Jump Rings and How They are Cut

When buying jump rings for jewelry, you'll want to look at how the rings are cut. Why?



When jump rings are cut off the mandrel, they will have a small gap at the place they were cut. This gap is also called a kerf. The smaller the kerf, the easier it is to make the ends of the ring meet up evenly.

You'll also want to look at how they are cut – whether both the ends are flush or if one is flush and the other has a point. You can see an example of one end being pointed in the photo to the left.

When both ends are flush, you can make your ends meet up so it looks seamless. When one of the sides has a point, you'll never quite get that seamless look.

Jump rings that are cut with a jeweler's saw (like the photo to the right) tend to have two flush ends and a small gap; this is ideal. If you're looking to buy online from a site that doesn't specify how the rings were cut, buy only a few at first.

Price isn't always the final factor, but in general, the lower the price, the more likely you are to get rings that aren't flush on both sides. I have gotten base rings inexpensively and they were almost perfectly flush, but that tends to be the exception.

So what happens when you get a batch of rings where the kerb is obvious, and won't look good in finished jewelry? You can use them to learn new weaves. And while you're doing that, you can get an idea of how many rings you will need for a specific jewelry project.

Weave Example

Here are examples of a weave made in several different gauges and ARs, so you can get an idea of how it all comes together. The weave I am demonstrating is the 4-in-2 weave.

From left to right they are:

- Copper, 16 gauge, AR=5.9
- Blue Aluminum, 16 gauge, AR=4.1
- Gold-plated brass, 18 gauge, AR=3.9
- Gunmetal-plated brass, 20 gauge, AR=3.7
- Gold-plated brass, 20 gauge, AR=2.9

The AR of the smallest rings (shown in more detail, to the right) was so tight that I gave up trying to make this weave a 4-in-2. Instead, it became a 4-in-1.

These are good examples of how AR makes a difference in a chain maille weave. The larger the AR, the more rings you can put through each one.

While the 4-in-2 weave can use almost any AR, not all weaves are quite so forgiving.

Here are two examples of one of the most popular weaves, the byzantine.

On top is an 18 gauge sterling silver, with an AR of 3.3

The bottom is gunmetal-plated brass, 20 gauge, with an AR of 3.7

Each shows the limit of the AR range, where the pattern still looks decent.

The sterling is a super-tight fit. The gunmetal is a loose fit; almost too loose.

Well, while you can't change the AR of a given ring, you can simulate a lower (or higher) AR. For example, here's the same gunmetal chain, but I added a third ring in the center that connects the byzantine links. (The new additions are in gold-plated brass.)

This additional width, which helps to simulate a lower AR, helps to stabilize the weave a bit.

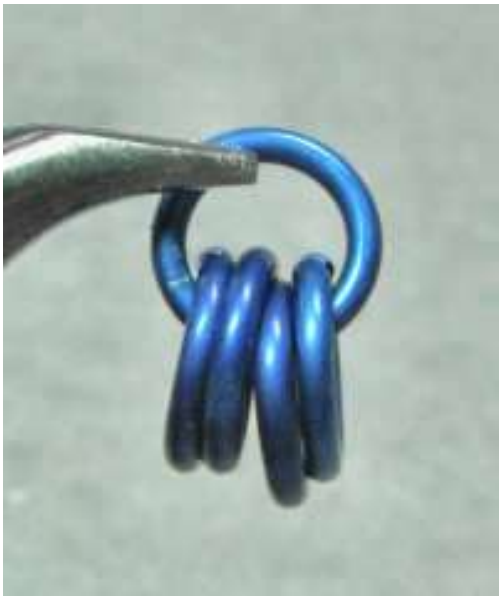
If you'd like to play with some rings a bit and you don't know how to do the 4-in-2, turn the page for some photos and instructions.

4-in-2 Weave

The 4-in-2 pattern gets its name from the fact that four rings go through any two rings. I've also seen this weave called "2 in 2", in that two new rings get added to the last two.

Begin by opening and closing several jump rings. I'm using the blue aluminum rings so that there isn't as much glare (and hopefully you'll see detail better). These rings have a pretty pronounced kerf, but they were really inexpensive which means I can play with them and not worry about wasting my good rings. ☺

Pick up an open ring and slip on four closed rings. Then close the open ring. You will have something that looks like this.



Next, pick up another open jump ring and slide it through the four rings you added. The original jump ring will fall to the bottom.

Close the new jump ring and lay the chain down.

Pick it up by two rings and you will see the chain beginning to take shape.

Pick up an open jump ring and slide it through the top two rings, then slip on two more closed rings.

Close the open ring and slide another open ring through the four. Close it as well.

Pick up your chain by the last two rings added and you have more length!

At this point, just keep repeating these last couple of steps until the chain is the length you want.

I hope you've enjoyed this tutorial, and that you'll take a look at other maille and beading tutorials that I've put together.

Before I Say Goodbye…

…here are two finished examples of chain maille, for your viewing pleasure.

This is the roundmaille chain. Made from 16 gauge sterling silver, it's closed with a lobster-claw clasp.

This is a European 6-in-1 chain, 5 sections wide. Made with 18 gauge sterling silver, it is closed with a slide clasp.