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Aspect Ratio Discussion for Chain-Making

It' simpler than it sounds! Let' review together the "math" of making chains. Please note that:

a. We will be primarily using inches and feet, rather than metric measurements. The reason for this is that using a drill rod (to make the mandrels) in units of 64ths of an inch provides a smaller increment between ring sizes than the 0.5mm increment available with metric sizes. We will, however, use 3mm and 5mm mandrels to fill a couple of gaps and ensure a smooth progression in the graduation of the smaller jump rings. Remember, inches may be converted to millimeters, and visa-versa, quite easily with a calculator. Simply multiply inches by 25.4 to get millimeters, or divide millimeters by 25.4 to get inches; and

b. We will be using the terms mandrel size and inside diameter of the jump rings interchangeably. This is almost true for the smaller size jump rings, and not quite so true for larger sizes because of the "spring back" of the coil when tension is released. This is generally not a problem because for most chain patterns the exact size of the large jump rings is not as critical as that of the smaller jump rings.

Aspect Ratio

The aspect ratio (AR) described the relationship between the inside diameter (ID) of the jump ring and the diameter of the wire (DW) is made from (not the gauge, please note, but the actual diameter). To calculate AR, divide the ID by the DW:

AR = ID / DW

In some reference materials, this may be called the 'key number' or one of several other names and, for many chains, the number will vary from 3 to 6 (or higher). Knowing the aspect ratio for a chain pattern allows you to determine what size jump rings to use to build that same chain pattern using any gauge wire you choose.

Every chain pattern has a minimum aspect ratio. It is generally impossible to construct the pattern using rings with an aspect ratio lower than the minimum or, if it is possible, the chain will be very stiff.

Some chain patterns have a very narrow range of suitable aspect ratios. For example, the left half of the Byzantine chain in the picture below was constructed using rings with the recommended aspect ratio of 3.5; the right half was made with rings of a larger aspect ratio (4.3).

Determining the correct jump ring size to use for a chain

Use the table on the following page for the following examples to help you select rings that will deliver the best result. For example, to construct a Byzantine chain (suggested aspect ratio is 3.5) using 18 gauge wire, following the green example on the table to determine the correct size jump rings. Scan across the top of the table to find the column headed "18 gauge." Now scan down the "18 gauge" column to the row with the aspect ratio closest to the 3.5 needed, and follow that row to the left to find the jump ring size you need: a 0.141" jump ring should be used. If you're using metric jump rings, a 3.5mm jump ring could also be used.

To change the wire size to 14 gauge for a chain pattern that calls for 16-gauge 0.250" jump rings, determine the current aspect ratio by finding the intersection of the column headed "16 gauge" and the row labeled "0.250" (yellow example) to see that the aspect ratio of the 16 gauge rings is 4.9. Now scan across the top of the table to the column headed "14 gauge" (blue example), and scan down the "14 gauge" column to the row with the aspect ratio closest to the 4.9 needed (4.9 in this case), and follow that row to the left to find the size jump ring you need: in this case, 0.313".
If you're using metric jump rings, 8.0mm jump rings could also be used.

Information offered courtesy of bijoux-de-terre.com

Jump Ring Aspect Ratios (Round Wire)—B&S Gauge for Precious Metals

ID inches	ID mm	22 gauge	20 gauge	18 gauge	16 gauge	14 gauge	12 gauge
—	1.6	2.5	2.0	—	—	—	—
0.078	2.0	3.1	2.4	2.0	—	—	—
0.094	2.4	3.8	2.9	2.3	—	—	—
—	.25	3.9	3.1	2.5	—	—	—
0.109	2.8	4.4	3.4	2.7	2.1	—	—
—	3.0	4.7	3.7	3.0	2.3	—	—
0.125	3.2	5.0	3.9	3.1	2.5	2.0	—
—	3.5	5.5	4.3	3.4	2.7	2.2	—
0.141	3.6	5.6	4.4	3.5	2.8	2.2	—
0.156	4.0	6.3	4.9	3.9	3.1	2.4	—
0.172	4.4	6.9	5.4	4.3	3.4	2.7	2.1
—	4.5	7.1	5.5	4.4	3.5	2.8	2.2
0.188	4.8	7.5	5.9	4.7	3.7	2.9	2.3
—	5.0	7.9	6.2	4.9	3.9	3.1	2.4
0.203	5.2	8.1	6.3	5.1	4.0	3.2	2.5
—	5.5	8.7	6.8	5.4	4.2	3.4	2.7
0.219	5.6	8.8	6.8	5.5	4.3	3.4	2.7
0.234	6.0	9.4	7.3	5.9	4.6	3.7	2.9
0.250	6.4	10.0	7.8	6.3	4.9	3.9	3.1
—	6.5	10.2	8.0	6.4	5.0	4.0	3.2
—	7.0	11.0	8.6	6.9	5.4	4.3	3.4
0.281	7.1	11.3	8.8	7.0	5.5	4.4	3.5
—	7.5	11.8	9.2	7.4	5.8	4.6	3.6
0.313	7.9	12.5	9.8	7.8	6.1	4.9	3.9
—	8.0	12.6	9.8	7.9	6.2	4.9	3.9
—	8.5	13.4	10.5	8.4	6.6	5.2	4.1
0.344	8.7	13.8	10.7	8.6	6.7	5.4	4.2
—	9.0	14.2	11.1	8.9	6.9	5.5	4.4
0.375	9.5	15.0	11.7	9.4	7.4	5.9	4.6
—	10.0	15.7	12.3	9.8	7.7	6.2	4.9
0.406	10.3	16.3	12.7	10.2	8.0	6.3	5.0
—	11.0	17.3	13.5	10.8	8.5	6.8	5.3
0.438	11.1	17.5	13.7	10.9	8.6	6.8	5.4
0.469	11.9	18.8	14.6	11.7	9.2	7.3	5.8
—	12.0	18.9	14.8	11.8	9.3	7.4	5.8
0.500	12.7	20.0	15.6	12.5	9.8	7.8	6.2

Table courtesy of bijoux-de-terre.com