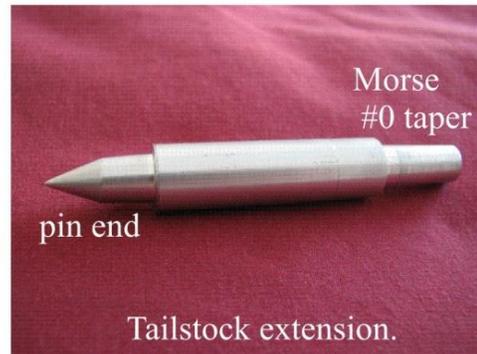
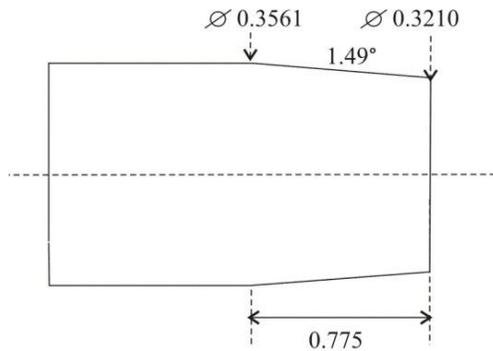


# What is a Morse Taper?



**Fig. 3: Left)** “Reduced-length” Morse #0 taper shape typically used on a tabletop lathe. **Right)** Dead center Morse Adapter, perhaps the simplest application of the LASER protractor.

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Terms such as Morse centers, arbors, machine taper, and taper refer to standardized taper shapes (basically slopes cut in a rod) used in machining tools (see Fig. 3). In modern terms, a Morse taper adapter gives one a “fast tool change system”. This idea refers back to Stephen A. Morse, a fellow who lived in 1800s and invented a number of basic machining tools (including twist drills). His company apparently still exists. One can find some historic notes at their web site at [http://www.morsecuttingtools.com/cgi/CGPTABOUT?PAMENU=7\\_1](http://www.morsecuttingtools.com/cgi/CGPTABOUT?PAMENU=7_1) In the meantime, Morse tapers are an accepted standard that follows the *International Organization for Standardization* (ISO). Morse tapers are numbered from #0 to #7, with diameters from 0.35” (9 mm) to 3.4” (87 mm). A Morse taper can be identified e.g. by measuring the diameter of the wider end:

Morse taper #	O.D. / inch	O.D. / mm
0	0.356	9.0424
1	0.475	12.065
2	0.700	17.780
3	0.938	23.825
4	1.231	31.267

**Tab. 1 :** Identifying Morse tapers by measuring the diameter (O.D.) of the wider end.

However, Morse tapers are often connected to shafts or other tool segments, which can make it difficult to identify the wider end. Therefore, we provide a transparent Morse #0 arbor, which can be used to test-fit the Morse taper (e.g. while cutting it). This is also

faster than measuring it. With this template, you can see and test the fit of the machined Morse taper perfectly. The Morse arbor is machined in transparent plastic by LatheCity using high-precision reamers. Other test arbors and steel versions are also available from LatheCity.

The Morse taper's slope is set to about  $\sim 1.5^\circ$ , but this depends on the taper size. (Fig. 3 defines the angle. In some outlines, the "included" angle is given, i.e.,  $\sim 3.0^\circ$ .) The end type and design details are rather complex. Other standards also exist, of course, such as the Jacobs taper and half a dozen more. Have a look at the following links given below for more details. E.g., the *Machinery's Handbook* includes an entire chapter about taper, including detailed drawings. Our Morse taper cutter accessory allows you to cut these Morse taper. Other taper shapes, of course, can also be machined. The protractor scale includes marks for the most common machine tapers. We offer that tool for Sherline and UNIMAT lathes.

[http://www.woodturners.org/tech\\_tips/morse\\_taper\\_sizes.htm](http://www.woodturners.org/tech_tips/morse_taper_sizes.htm)

<http://www.beautifuliron.com/mttaper.htm>

[http://en.wikipedia.org/wiki/Morse\\_taper#Morse](http://en.wikipedia.org/wiki/Morse_taper#Morse)

<http://www.tools-n-gizmos.com/specs/Tapers.html>

[http://www.machinist-guide.com/morse\\_taper\\_dimensions.html](http://www.machinist-guide.com/morse_taper_dimensions.html)

<http://www.littlemachineshop.com/Reference/Tapers.php>

<http://www.beautifuliron.com/mttaper.htm> | curiosities

<http://www.tools-n-gizmos.com/specs/Tapers.html> | specs

Links can be found at the customer corner at [www.LatheCity.com](http://www.LatheCity.com), i.e., you have not to type those assuming that one of the LatheCity books was purchased.

## Why is a Morse Taper Useful?

**Tailstock.** The Sherline lathe has a Morse #0 taper at the tailstock spindle. (Most tailstock arbors on full size systems also use the Morse taper.) A number of useful accessories fit in the tailstock and therefore require a Morse taper end. Miniature size #0 Morse taper are, however, rather difficult to purchase.

**Headstock.** The headstock of a lathe also typically has a Morse taper (#1 size on Sherline's system). Milling machines and professional drill presses also use Morse tapers. (Other standards are also used, but nearly all of these have taper shapes.)

**Morse adapters.** Due to the high popularity of the Morse ISO standard, you can find various adapters, but they will cost you. Furthermore, it is also rather difficult to find miniature sizes such as Morse #0 taper for tabletop systems, since most tool manufacturers cover the needs of professional shops, which typically use only full size systems with Morse #2 and larger taper sizes. For professional machine shops, it's perhaps OK if Morse adapter costs \$30/piece or more. In any case, with our LASER protractor, you can make your own Morse adapters for below \$1/piece plus your time. In addition, specialty pieces that hold miniature drills or center drills can be made. These are usually unavailable commercially. (LatheCity, which is specialized in benchtop systems, does offer some of these at acceptable costs, in our view. We also cut customized sizes; however, now you can make those by yourself... actually, we are crazy to offer this tool...)

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