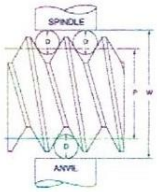
Years before inventing the FMS thread pitch diameter measurement system, I made and used the table below. This let me measure external thread pitch diameter with a wire diameter that I didn't always have. It was neither quick or easy but of course could be done. Knowledge of trigonometry and a pocket calculator were necessities.

One of the things I never really understood when measuring with wires, especially when measuring threads in machine shops, was the accuracy to which wires were made. The "constant" to be deducted made the final result appear to be much more accurate than the accuracy of the micrometer could ever be. Solid thread gauges are hardened and ground and have much tighter tolerances than threaded items. Threaded items have also tolerances on the flank angle that wires don't take into consideration. The FMS system gives the true pitch diameter even when the flank angle isn't exactly what it should be.

Measuring external threads with wires is common and gives a result but the final measurement result should be given more thought as to possible deviations from the true pitch diameter.

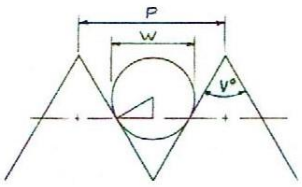



# THREAD MEASUREMENT USING THREAD WIRES

Please note that that the values given for **X** on this page are not intended for thread plug gauge calibration.

The table below shows, among other things, which wire (cylinder) diameter (**W**) should be used when measuring the pitch diameter on various thread types.

| **Metric 60°** | | | **Whitworth 55°** | | | **UN** (American) **60°** | | |
|---|---|---|---|---|---|---|---|---|
| **P** (mm) | **W** (mm) | **X** (mm) | TPI (**P** mm) | **W** (mm) | **X** (mm) | TPI (**P** mm) | **W** (mm) | **X** (mm) |
| 0,5 | 0,29 | 0,44 | 48 (0,529) | 0,335 | 0,55 | 56 (0,454) | 0,29 | 0,48 |
| 0,6 | 0,335 | 0,49 | 40 (0,635) | 0,335 | 0,45 | 48 (0,529) | 0,335 | 0,55 |
| 0,7 | 0,455 | 0,76 | 32 (0,794) | 0,53 | 0,92 | 44 (0,577) | 0,335 | 0,51 |
| 0,75 | 0,455 | 0,715 | 28 (0,907) | 0,53 | 0,81 | 40 (0,635) | 0,335 | 0,46 |
| 0,8 | 0,455 | 0,67 | 26 (0,977) | 0,62 | 1,03 | 36 (0,706) | 0,455 | 0,75 |
| 1,0 | 0,62 | 1,00 | 24 (1,058) | 0,62 | 0,95 | 32 (0,794) | 0,455 | 0,68 |
| 1,25 | 0,725 | 1,09 | 22 (1,155) | 0,725 | 1,19 | 28 (0,907) | 0,53 | 0,81 |
| 1,5 | 0,895 | 1,39 | 20 (1,270) | 0,725 | 1,08 | 24 (1,058) | 0,62 | 0,94 |
| 1,75 | 1,10 | 1,79 | 19 (1,337) | 0,725 | 1,01 | 20 (1,270) | 0,725 | 1,08 |
| 2 | 1,35 | 2,32 | 18 (1,411) | 0,895 | 1,48 | 18 (1,411) | 0,895 | 1,46 |
| 2,5 | 1,65 | 2,79 | 16 (1,588) | 0,895 | 1,31 | 16 (1,588) | 0,985 | 1,58 |
| 3 | 2,05 | 3,555 | 14 (1,814) | 1,10 | 1,74 | 14 (1,814) | 1,10 | 1,73 |
| 3,5 | 2,05 | 3,12 | 12 (2,117) | 1,35 | 2,24 | 13 (1,953) | 1,10 | 1,61 |
| 4 | 2,55 | 4,19 | 11 (2,309) | 1,35 | 2,06 | 12 (2,117) | 1,35 | 2,22 |
| 4,5 | 2,55 | 3,755 | 10 (2,540) | 1,65 | 2,78 | 11 (2,309) | 1,35 | 2,05 |
| 5 | 3,20 | 5,27 | 9 (2,822) | 1,65 | 2,51 | 10 (2,540) | 1,65 | 2,75 |
| 5,5 | 3,20 | 4,84 | 8 (3,175) | 2,05 | 3,44 | 9 (2,822) | 1,65 | 2,51 |
| | | | 7 (3,629) | 2,05 | 3,00 | 8 (3,175) | 2,05 | 3,40 |
| | | | 6 (4,233) | 2,55 | 4,01 | 7 (3,629) | 2,05 | 3,01 |
| | | | 5 (5,080) | 3,20 | 5,25 | 6 (4,233) | 2,55 | 3,98 |
| | | | 4,5 (5,644) | 3,20 | 4,71 | 5 (5,080) | 3,20 | 5,20 |
| | | | | | | 4,5 (5,644) | 3,20 | 4,71 |




**P** = Pitch in mm or T.P.I. (Threads Per Inch)

**W** = Wire diameter

**X = the number to be subtracted from the measurement result to find pitch diameter $d_2$**

**$V^o$** = flank angle

***The theoretically correct wire diameter can be calculated from the following formula :-***

**where $V^o = 60^o$ $W = 0{,}57735\ P$** or where **$V^o = 55^o$ $W = 0{,}56368\ P$**

***Pitch diameteren $d_2$ can also be calculated from :-***

where **$V^o = 60^o$** $d_2$ = Measurement over wires + 0,866**P** – 3**W** **X** = + 0,866**P** – 3**W**

where **$V^o = 55^o$** $d_2$ = Measurement over wires + 0,9605**P** – 3,1657**W** **X** = + 0,9605**P** – 3,1657**W**

*N.B. when calculating use the actual wire diameter.*

*The measurement over the wires **must** be greater than the thread's diameter (d).*

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