Imperial Threads on HLV-H

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Internal headstock fixed gear box ratios are as follows

$$\begin{aligned}
&\text{spindle} : \text{intermediate shaft} = 2 : 5 \\
&\text{intermediate} : \text{change shaft} = 2 : 1 \text{ (knob position 1)} \\
&\text{intermediate} : \text{change shaft} = 1 : 1 \text{ (knob position 2)} \\
&\text{intermediate} : \text{change shaft} = 1 : 2 \text{ (knob position 3)}
\end{aligned}$$

The 127t gear goes on the end of the *change shaft*. The reduction ratio of the external gears is then

$$\text{change shaft} : \text{screw shaft} = \frac{127}{\text{2nd gear on stud}} \times \frac{\text{1st Gear on Stud}}{\text{Screw Gear}}$$

Therefore given that the lathe has a 3mm pitch lead screw, letting

$$R = \begin{cases} 2 & \text{knob position 1} \\ 1 & \text{knob position 2} \\ 1/2 & \text{knob position 3} \end{cases}$$

Then

$$\text{Pitch} = \frac{2}{5} \times R \times \frac{127}{\text{2nd gear on stud}} \times \frac{\text{1st Gear on Stud}}{\text{Screw Gear}} \times 3\text{mm}$$

Using the fact that TPI = 25.4/Pitch (mm)

$$\text{TPI} = \frac{\text{Screw Gear} \times \text{2nd Gear on Stud}}{\text{1st Gear on Stud} \times 6R}$$

The factor $6R$ in the denominator is thus 12, 6 or 3 depending upon whether the knob is in positon 1, 2 or 3.

As an example consider the manual for 39 tpi. This is knob position 3, first on stud 25, second on stud 45 and screw gear 65. Thus

$$\text{TPI} = \frac{65 \times 45}{25 \times 3} = 39$$