



HANDTORQUE® TORQUE MULTIPLIERS

### What is a Torque Multiplier?

A torque multiplier is a device that increases the torque that can be applied by an operator. This is because the power output cannot exceed the power input, the number of output revolutions will be lower than the number of input revolutions (Torque x rpm = Power).

### How HandTorque® Torque Multipliers Work

HandTorque® multipliers incorporate an 'epicyclic' or 'planetary' gear train having one or more stages. Each stage of gearing increases the torque applied, allowing Norbar to offer multipliers typically in ratios of 5:1, 27:1 and 135:1.

In the planetary gear system, torque is applied to the input gear or 'sun' gear. Three or four planet gears whose teeth are engaged with the 'sun' gear therefore rotate. The outside casing of the multiplier, or 'annulus' is also engaged with the planet gear teeth, and would normally rotate in the opposite direction to the 'sun' gear. A reaction arm prevents the annulus from rotating, and this causes the planet gears to orbit around the 'sun'. The planet gears are held in a 'planetary' carrier which also holds the output square drive, therefore as the planet gears orbit around the sun gear, the carrier and so the square drive turns. Without the reaction arm to keep the annulus stationary, the output square will not apply torque.

No gearbox is 100% efficient, and so the velocity ratio (the number of turns that the input has to make to achieve one revolution of the output) is not the same as the torque multiplication ratio. Norbar multipliers are engineered such that each gear stage typically has a nominal 5:1 ratio, this means a velocity ratio of typically 5.45:1 which results in a true torque multiplication factor of 5.2:1.



*Without a torque multiplier*



*With a torque multiplier*

