# Let’s Torque Reaction Plates

**Torque reaction plates or arms are essential to absorb the reaction forces of powered and manually operated torque multipliers. Getting the right reaction plate for the job is vital, and Norbar Torque Tools can offer a range of torque reaction solutions to suit all applications.**

“For every action there is an equal and opposite reaction” is, as every school child should know, Newton’s Third Law of Motion. When applied to torque tools it means that when a tool applies a torque to a fastener or other application there will be a (more or less) equal and opposite reaction torque that has to be absorbed.

Norbar power torque tools and Handtorque multipliers rotate continuously with no pulsing or impact, and so rely on a reaction arm to absorb the reaction force. With some tools applying torques of up to 100,000 Nm the design, construction and use of the reaction place is critical.

The reaction plates on Norbar products come in a number of different configurations. However, in all cases the reaction is located by the operator to rest on an adjacent solid structure, such as another bolt on the flange, where it is able to absorb the reaction torque.

Problems can arise however where there is no convenient point for the reaction plate. If for example a fastener being tightened is recessed or in a difficult location the operator may be tempted to bend or extend the reaction plate.

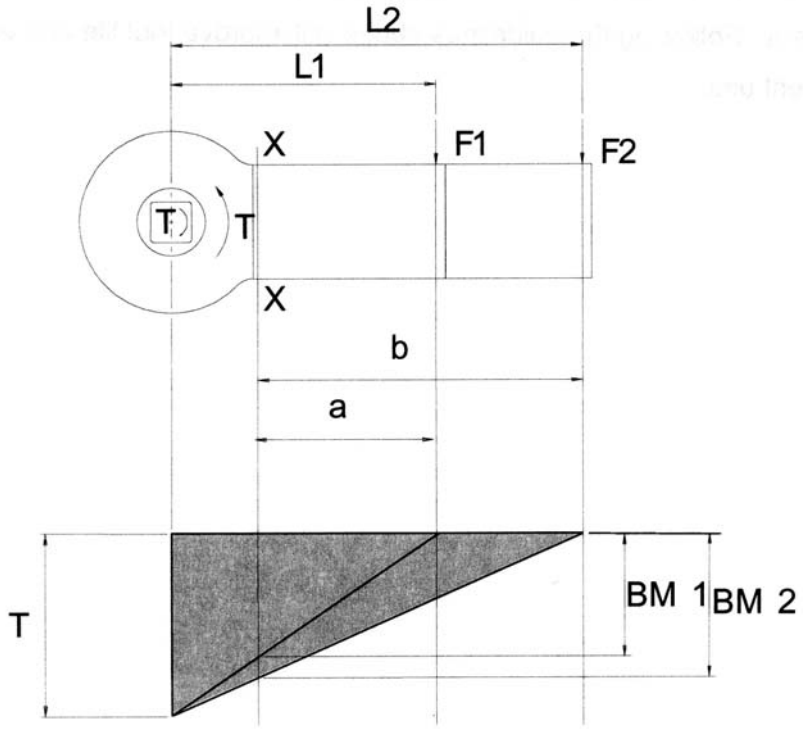
This may cause the plate, tool or socket being used to twist, bend or break, with potentially disastrous consequences for the equipment or operator.

Options include reaction plates that are curved or have sliding feet to make contact with a suitable reaction point, and tubular steel plates that are lighter and more manageable for jobs where torque tools have to be frequently manhandled.

For accessing hard-to-reach fasteners such as deeply recessed wheel nuts, Norbar can supply reaction nose extensions for hand or power tools. These incorporate a bearing supported shaft which ensures that only torsional forces are passed to the tool. Traditional extensions shafts or long sockets cause extensive side loading and premature tool failure.

There are also other factors to take into account when using standard reaction plates. Extending a torque plate beyond its design length by welding on extra material for example may cause the plate to break. Even though the torque remains the same and the force applied to the end of the longer plate is reduced, the bending moment on the plate close to the tool is increased (Fig 1).

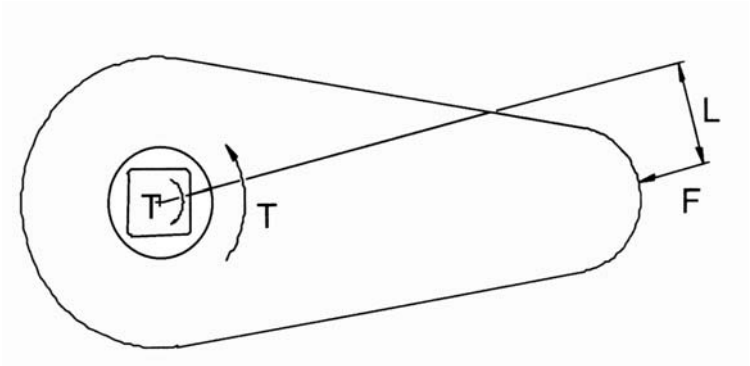
*Fig 1: Calculation of bending moment for different lengths of reaction plate*




If reaction is taken at distance L1 then the reaction force, F1 can be calculated. This generates a bending moment of (F1 x a) at section xx. If the reaction plate is extended and reaction is taken at L2, then the reaction force is reduced and becomes F2. In this case the bending moment becomes (F2 x b) which will always be greater than (F1 x a), therefore the bending stress at section xx will greater. In the second instance the reaction plate may fail.

Where flat reaction plates with radiused ends are used to react with a surface that is not perpendicular to the axis of the reaction plate itself the force applied to the end of plate may increase dramatically (Fig 2).

*Fig 2: Calculation of reaction force on radiused reaction plate.*




In the case of the curved end of a flat reaction plate the line of action of the reaction forces passes through the centre of the curve. The further round the curve that reaction is taken the smaller will be the perpendicular distance, L, and in consequence the greater the reaction force, F.

Torque reaction tools are a safe and ergonomic solution to any high torque turning requirement. Following the guidelines above will improve tool life and ensure their safe and efficient use.