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Understanding Braking Force and Coefficient of Friction

Braking force is defined as the tangential force, acting on a disc, at the effective radius. This force is a function of the clamping force applied by the caliper, pressing the pads onto the disc, and the coefficient of friction (μ) generated between the lining material and the disc surface.

This friction coefficient will vary greatly depending on a number of factors, including:

- Friction pad material and production batch
- Disc material and surface finish
- Environment and operating conditions
- Duty (static holding, dynamic stopping, continuous tensioning)
- Pad pressures and rubbing speed
- Braking path temperatures
- Contamination of the disc or pads

In order to provide a meaningful comparison between a range of caliper types, brake manufacturers publish a nominal coefficient of friction on which brake performance is calculated. This is typically a value between 0.35 and 0.45.

<u>All Twiflex published catalogues, data sheets and performance graphs assume a figure of 0.4, for standard organic linings, unless otherwise stated.</u>

This represents mean friction, under ideal conditions, with fully bedded-in (burnished) and conditioned pads.

In practice, and in consideration of standard organic linings, it would be reasonable to expect a reduction of 25-30% for new or partially burnished pads. Dynamic friction at elevated rubbing speeds may be even lower still. It is therefore recommended that each application is considered on a case-by-case basis, with sufficient service factor applied to a brake selection to accommodate the likely worst-case conditions.

Twiflex Application Engineers can assist in providing details of expected operating characteristics and subsequent brake performance.

Definition of Braking Terms:

F_b	Braking Force
F_c	Clamping Force (or "Normal Force", F_n)
μ	Coefficient of Friction
r_e	Effective Radius
T_b	Braking Torque
W	Pad Width (or "Swept Braking Path")

Braking Force, $F_b = 2.\mu.F_c$
Braking Torque, $T_b = F_b.r_e$

Typically, dynamic torque is around 10-15% lower than static torque under identical conditions.