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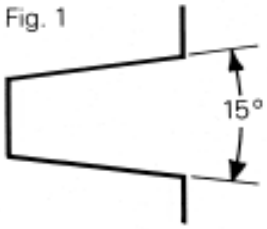
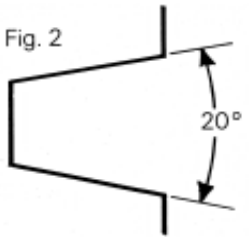
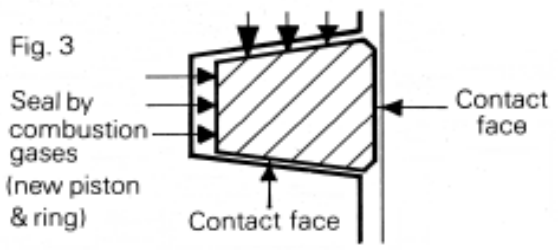
Keystone Rings and Piston Grooves

Many diesel engines use a piston that has one or more taper-sided compression ring grooves. The purpose of the design is to overcome the possibility of ring sticking, the configuration allowing the side clearance to alter as the ring moves in the groove, preventing carbon build up. The groove finish and angle (ranging between 12° and 20°) is of vital importance to ensure efficient operation and the condition of the grooves must be thoroughly examined before re-ringing during overhaul. (Figures 1 and 2.)





Because of the nature of the design, ring movement in the groove and subsequent groove wear may be more prevalent. All ring grooves whether parallel or taper sided should be smooth and flat and usually the same angle as the ring. It is only by this kind of "companion geometry" that an effective gas seal is achieved. Compression rings rely upon combustion gases forcing the ring against the lower face of the groove and against the cylinder wall to affect proper sealing. (Figure 3.)



The use of pistons with worn grooves should be avoided, as less than optimum results can be expected. A new ring will not seat properly in a worn groove, resulting in lack of combustion seal. In particular a new ring in a worn taper groove will twist and flex, possibly resulting in ring breakage (Figure 4.). Close examination of the piston ring grooves should be made and *as a rough guide* of wear limits, a 0.006" (0.152 mm) feeler blade should not be able to enter the groove with a new ring in place. If the gauge enters the groove, wear is excessive and the piston should be replaced (Figure 5.).