```
R1[s_, i_, j_] := s (g_{ji} (g_{j+,j} + g_{j,j+} - g_{ij}) - g_{ii} (g_{j,j+} - 1) - 1/2);

ρ[K_] := ρ[K] = Module[{Cs, φ, n, A, s, i, j, k, Δ, G, ρ1},
  {Cs, φ} = Rot[K]; n = Length[Cs];
  A = IdentityMatrix[2 n + 1];
  Cases[Cs, {s_, i_, j_} :> (A[[{i, j}, {i + 1, j + 1}]] += ({{-T^s, T^s - 1}, {0, -1}}))];
  Δ = T^((-Total[φ] - Total[Cs[[All, 1]]])/2) Det[A];
  G = Inverse[A];
  ρ1 = Sum_{k=1}^{n} R1 @@ Cs[[k]] - Sum_{k=1}^{2 n} φ[[k]] (g_{kk} - 1/2);
  Factor@{Δ, Δ^2 ρ1 /. α_^+ :> α + 1 /. g_{α_,β_} :> G[[α, β]]}];
```