Fisz-Cramér-von Mises two-samples test

Cramér-von Mises statistics ω^2 measures the quadratic deviations between the empirical distribution function F_n of a sample and the empirical distribution function of a theoretical function F, multiplied by a weighting function $\psi(x)$:

$$\omega^2 = \int_{-\infty}^{\infty} [F(x) - F_n(x)]^2 \psi(x) \mathrm{dF}$$

In the case of Cramér-von Mises test statistics the weigthing function is:

$$\psi(x) = 1$$

Fisz generalised Cramér-von Mises test statistics to the specific case of the comparison of two samples.
The aim of this test is to compare two distributions, f and g with respectively n and m observations, in order to test whether the two independent samples involved have been drawn from the same population.
Deriving from Cramér-von Mises test statistics, the test statistics t computation involves the two empirical distribution functions F and G. If the two samples have been drawn from the same population distribution, the cumulative distributions of both samples may be expected to be close to each other; if the two sample cumulative distributions differ, this suggests that the samples come from different populations.

$$t = \frac{nm}{(n+m)^2} \{ \sum_{i=1}^{n+m} [F_n(x_i) - G_m(x_i)]^2$$

This test can be applied in the case of binned distributions; it is satisfactory in the case of symmetric distributions and of right-skewed distributions.
In the case of unbinned distributions, this test is not independent on the distribution parameters.
A table of the asymptotic distribution is available in the paper by Anderson et Darling[1] and Anderson[2].

[1]T.W.Anderson, D.A.Darling, *A test of goodness-of-fit* American Statistical Association Journal, 1954.

[2]T.W.Anderson, *On the distribution of the two-sample Cramér-von Mises criterion*, Annals of Mathematical Statistics, 1962.