EXAMPLE OF METHOD FOR COMPUTATION OF CONVERSION FACTORS FROM COUNTRY A TO COUNTRY B, APPLYING WILMINK'S METHOD

In this example 10 sires are supposed to have estimated breeding values (EBV) for, say protein yield, in two countries A (exporting) and B (importing).

	Country B (imp.)		Country A (exp.)	
Sire	R_B	EBV_B	R_A	EBV_A
1	.94	30	.99	-6
2	.87	37	.99	-11
3	.83	22	.99	-9
4	.99	16	.99	22
5	.97	46	.99	13
6	.91	15	.99	-10
7	.98	43	.99	11
8	.84	17	.99	-8
9	.97	29	.99	-5
10	.96	48	.99	4

In this example R_B stands for repeatability of the estimated breeding value (EBV_B) in country B. Likewise R_A and EBV_A for country A.

In order to estimate the conversion factors, proceed the following steps:

1. Compute the means for EBV_B and EBV_A: $\overline{EBV}_B$ and $\overline{EBV}_A$.

2. Estimate the regression coefficient β by ordinary least-squares in the regression model:

$$Y_i = \alpha+\beta \cdot X_i+E_i$$

where: Y_i = EBV_B of sire i
X_i = $R_B(EBV_A-\overline{EBV}_A)$ for sire i
E_i = not explained part by the model
α = intercept
β = regression coefficient.

The conversion factor b in the conversion formula is given by β.

3. Compute conversion factor a: $a = \overline{EBV}_B-\beta \cdot \overline{EBV}_A$

Using the above example, solutions for steps 1-3 are:

1. $\overline{EBV}_B$=30.30; $\overline{EBV}_A$=-4.30

2. ANOVA table (after correction for mean Y and X):

Source	**Degr of freedom**	**Sums of squares**	**F-value**
regression	1	957.002	15.464
rest	8	495.098	
total	9	1452.100	

The correlation between Y and X is 0.812

Estimates for α and β are: $\alpha=30.089$; $\beta=0.9955$

3. a=34.58

Conversion formula:
(converted proof to B) =34.6+1.00·(proof in country A).

4. Computation of the reliability of a converted proof

The reliability of the converted breeding value (R_C) is calculated as:
$R_C = R_A * R_g * R_g * 0.95$

where R_g is the genetic correlation between the traits measured in country A and B. Note that R_g may reflect genotype * environment interaction as well. The factor 0.95 is an adjustment factor for the loss in reliability by conversion (depends among others on SE(A) and SE(B), see Wilmink et al. (1987)). For parctical purposes the adjustment factor can be fixed at 0.95 (seems more justified than the proposed value of 1.00 by Wilmink et al. (1987)). In this example R_g was assumed to be 1.00 (first lactation in both cases) so that

$R_C = 0.99 * 1.00 * 1.00 * 0.95 = 0.94$ for all converted proofs.