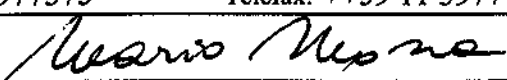


EUROMET PROJECT FINAL REPORT

1. Ref. No. <div style="text-align: center;">317</div>	2. Field: <div style="text-align: center;">Mass</div>
3. Type of collaboration: <div style="text-align: center;">Consultation on facilities</div>	
4. Partners: <div style="text-align: center;">BIPM, DE(PTB), DK(DFM), ES(CEM), FR(LNE), IT(IMGC), NO(JV)</div>	
5. Subject: <div style="text-align: center;">Mathematical models for linearising the scales of balances</div>	
6. Progress: <p>The Project developed in studying the possibility of fitting the calibration curve of a balance with a polynomial law. The possibility of using the total least squares method [1] and the Gauss method [2, 3, 4, 5] has been explored. An intercomparison of balance calibration data has been performed [4]. The discussion on the achieved data demonstrated the need of taking account of three main sources of uncertainty: the mass standard used for the calibration, the reading repeatability and the model inadequacy.</p> <p>Starting from these suggestion, two methods have been proposed for data treatment: the first using the Lagrange multipliers [6], the second using a modified version of the weighted least squares [7]. The methods allow to obtain compatible fitting curves. A final report summarising the capability of these methods has been prepared [8] and will be published in the near future.</p> <p><u>References:</u></p> <p>[1] M. Mosca "Linearisation of the scale of balances" IMGIC Report P207bis, Feb. 94</p> <p>[2] M. Mosca "Characterising balance non-linearity with errors in the variables" IMGIC Report P214, Jan. 1995</p> <p>[3] M.J.Hita, A.Lumbreras, J.C.Gonzalez "Informe 317 Linealidad de la escala de Balanzas" CEM - 1995</p> <p>[4] R. Davis, M. Gläser, C. Matilla, M. Mosca, T. Myklebust "Characterising balance nonlinearity with errors in the variable: result of an intercomparison" IMGIC Report P224, Jan. 1996</p> <p>[5] T. Myklebust "Characterising non-linearity of mass comparators and weighing instruments when it is uncertainty in the variables (input quantity)" Justervesenet - Sept. 1996</p> <p>[6] L. Nielsen "Least squares estimation using Lagrange multipliers"; III Conference on Mathematical Tools for Metrology - Berlin</p> <p>[7] M. Mosca "Calibration of the linearity of balance scales taking account of the uncertainty in the variables" to be presented at IMEKO XIV World Congress - Tampere</p> <p>[8] M. Mosca, L. Nielsen "New algorithm for the Calibration of the linearity of Balance Scales" to be published</p>	
7. Co-ordinator's name: Mario Mosca e-mail: M.Mosca@imgc.to.cnr.it Address: Istituto di Metrologia "G. Colonnetti" Strada delle Cacce, 73 - I 10135 TORINO (Italy) Telephone: ++ 39 11 3977375 Telefax: ++39 11 3977437	8. Completion date: <div style="text-align: center;">May 31, 1998</div>
9. Co-ordinator's signature: 	10. Date: <div style="text-align: center;">Sept. 4, 1998</div>

Notes for the completion of the form overleaf