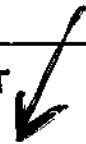


**EUROMET PROJECT  
FINAL REPORT**



1. Ref. No.: <b>256</b>	2. Subject Field: Mass (Pressure)
3. Type of collaboration: Cooperation in Research	
4A. Partners: IMGc, LNE, NPL, PTB (institutions)	4B. CEC funded? NO
5. Participating countries: IT, FR, GB, DE	
6. Title: Calculation of the elastic distortion of piston-cylinder assemblies in pressure balances and in hydraulic amplifiers in force machines	
<p>7. Progress:</p> <p>Calculations of elastic distortion in two pressure balances, of PTB (400 MPa, free-deformation type) and of LNE (two assemblies, 200 MPa, free-deformation and controlled-clearance types), have been completed. In 1996 NPL revised their calculations methods using new finite-element-analysis programs and produced new results [1]. All results are fully described in eight Internal Reports of IMGc, NPL and PTB from January 1994 to July 1996.</p> <p>Conclusions are so summarised :</p> <p>1)PTB 400 MPa unit of the free deforming type: maximal differences between the distortion coefficients calculated at 80, 120, 200 and 400 MPa by the IMGc, NPL and PTB methods correspond to relative discrepancies in the measured pressure of 0,2 ppm, 1,4 ppm, 3 ppm and 6,7 ppm respectively.</p> <p>2)LNE 200 MPa units of the free-deforming type: maximal differences between the distortion coefficients calculated at 120 and 200 MPa by the IMGc, NPL and PTB methods correspond to relative discrepancies in the measured pressure of 6,7 ppm and 10,8 ppm respectively for one unit and 0,1 ppm and 8,8 ppm for the other unit.</p> <p>3)LNE 200 MPa units of the controlled clearance type: maximal differences between the distortion coefficients calculated at 200 MPa by the IMGc, NPL and PTB methods (for unit # 4) correspond to a relative discrepancy in the measured pressure of 6,4 ppm . Here the agreement between the calculated methods is relatively satisfactory, but disagreement is considerable (equivalent to a relative pressure difference as high as 56,6 ppm) to the experimental values. A different model, in which beside the loads on the external surface of the cylinder also stress distribution of O-rings is considered, was used. This model, which surely approaches the calculated model to the real system used in experiments, was successful and explained the differences. A paper [2] is in progress and will be submitted to "Metrologia" for publication.</p> <p><u>Papers / Internal Reports</u></p> <p>[1] G. M. Robinson, NPL Report MOT6, Second NPL analysis of the distortion of pressure balances as part of EUROMET Project 256, Teddington, July 1996</p> <p>[2] G. Molinar, W. Sabuga, G. Robinson and J.C. Legras, Comparison of Methods for Calculating Distortion in Pressure Balances up to 400 MPa - EUROMET Project # 256, to be sent to "Metrologia" for publication</p>	
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9. Completion date: July 1997	10. Coordinator's signature: 
11. Date: February 1997	