EUROMET PROJECT
Final Report

1. Ref No.:	530	2. Subject Field:	Length
3. Type of collaboration:	Consultation on facilities		
4A. Partners:	JV, SP	4B. CEC funded?	No
5. Participating Countries:	NO, SE		
6. Title:	Uncertainty components on line scale measurements		

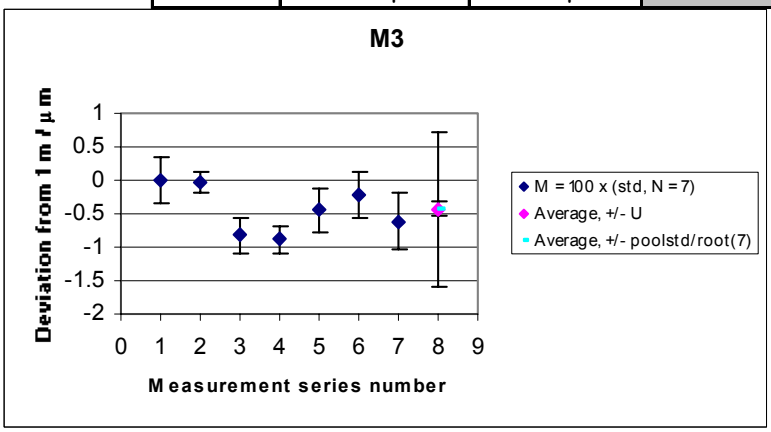
7. Final report: This uncertainty budget refers to measurements carried out at JVs laboratories.

$$\Delta Y = (p_1 - p_0) + \delta L_{sym} + \delta L_{HP} + \Delta\phi\, D + \delta L_{xy} + \delta L_{focus} - \Delta T \alpha L$$

ΔY Deviation from 1 m.

1. $(p_1 - p_0)$ Reading, distance between position p_1 and p_0.
2. δL_{sym} Correction for different symmetry of the lines, an imaging problem.
3. δL_{HP} Correction for calibration of HP-interferometer.
4. $\Delta\phi\, D$ Correction for Abbe deviation.
5. δL_{xy} Correction for deviation in alignment of line of movement for reflector.
6. δL_{focus} Correction for deviation in focus.
7. $\Delta T \alpha L$ Correction for deviation in temperature measurement.

X_i	x_i	u_{xi}	Distribution	c_i	u_{yi}
$p_1 - p_0$	-2.11 µm	0.11 µm	Normal	1	0.11 µm
δLsym	0	0.20 µm	Rect	1	0.20 µm
δL_{HP}	0	0.20 µm	Normal	1	0.20 µm
$\Delta\phi$	0.056 mm/m	0.002 mm/m	Rect	D = 30 mm	0.07 µm
δL_{xy}	0	0.10 µm	Rect	1	0.10 µm
δL_{focus}	0	0.36 µm	Normal	1	0.36 µm
ΔT	0	0.03 K	Rect	αL = 8.69um/Km	0.26 µm
α	$8.69 \cdot 10^{-6}$ K^{-1}	$1 \cdot 10^{-6}$ K^{-1}	Rect	u(ΔT) L = 0.05 Km	0.05 µm
ΔY	-0.43 µm	0.55 µm		u_y	0.55 µm
				k	2.08
				U	1.15 µm



10 measurements in each series, 7 measurement series, gives a pool for calculation of uncertainty contribution from repeatability with 63 degrees of freedom. (Comp. 1)

Effective degrees of freedom = 33.
k = 2.08
Result for measurement of M3:
$\Delta Y = -0{,}43$ µm $\pm$ 1,15 µm

8. Proposer`s name: Helge Karlsson
Address: Justervesenet (Norwegian Metrology and Accreditation Service), Fetveien 99, 2007 Kjeller
Telephone: +47 64 84 84 84 Telex: Telefax: +47 64 84 84 85
E mail: helge.karlsson@justervesenet.dep.telemax.no

8. Completion Date:	10. Coordinator`s signature:	11. Date:
16.10.00	Helge Karlsson	16.10.00

Notes for the completion of the form overleaf