COFRAC accreditation of an innovative method for checking measuring arms in the shopfloor and assessments of associated uncertainties

François HENNEBELLE[1], Jean-Marc PRAS[2], Christophe GABEAU[3], Bernard LARQUIER[4], Thierry COOREVITS[5], Siriwan BORIPATKOSOL[6]

[1] DRIVE EA1859, Univ. Bourgogne FrancheComté, Nevers, France

[2] Eurotek, 3 Rue Louis Armand, 95230 Soisy Sous Montmorency, France

[3] Kreon Technologies, 19 Rue Columbia, 87280 Limoges, France

[4] BEA Metrologie, 10 avenue Jacqueline Auriol, 33700 Merignac, France

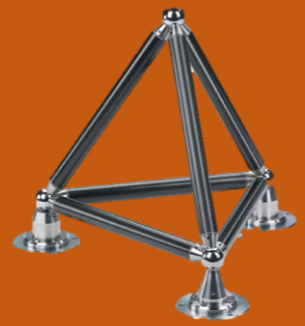
[5] Mechanics, Surfaces and Materials Processing, MSMP-EA 7350, Arts et Métiers, Lille 59800, France

[6] King Mongkut's University of Technology North Bangkok, Thaïland – Using the accreditation method for GeoWorks in Thaïland

ACTeD Method allow to have an equivalent of E_{Uni} of the 10360-12

Objective : Find the maximum error in a distance measurement whatever the length and position of the AACMM or the standard part in the measuring range

ACTeD test



Objective & Validation

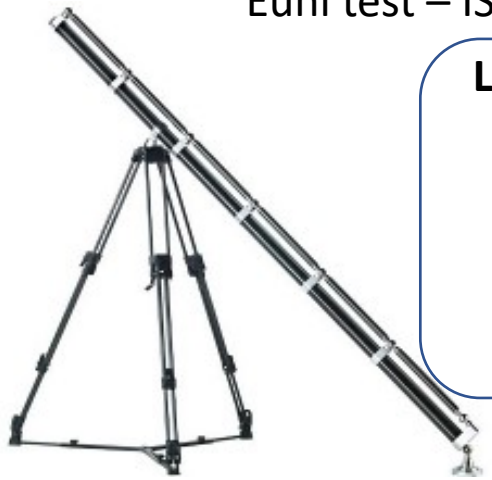
Validation has been presented at the CIM2021 and publied:

El Asmai, S., Hennebelle, F., Coorevits, T., Vincent, R., & Fontaine, J. F. (2020). Proposition of a periodic verification test for Articulated Arm Coordinate Measuring Machines using a small 3D artefact. *Measurement*, *154*, 107472. https://doi.org/10.1016/j.measurement.2020.107472

Comparaison between E_{Uni} of ISO 10360-12 test & ACTeD test:

- ✓ Encoders variations similar
- ✓ Similar mechanical deformation (simulation & strain gauge measurements)
- ✓ Intercomparison with different AACMM (size & manufacturer)

Euni test – ISO 10360-12



Length errors

Measure
5 lengths
in 7 directions
with 3
measurements
repeatability

~

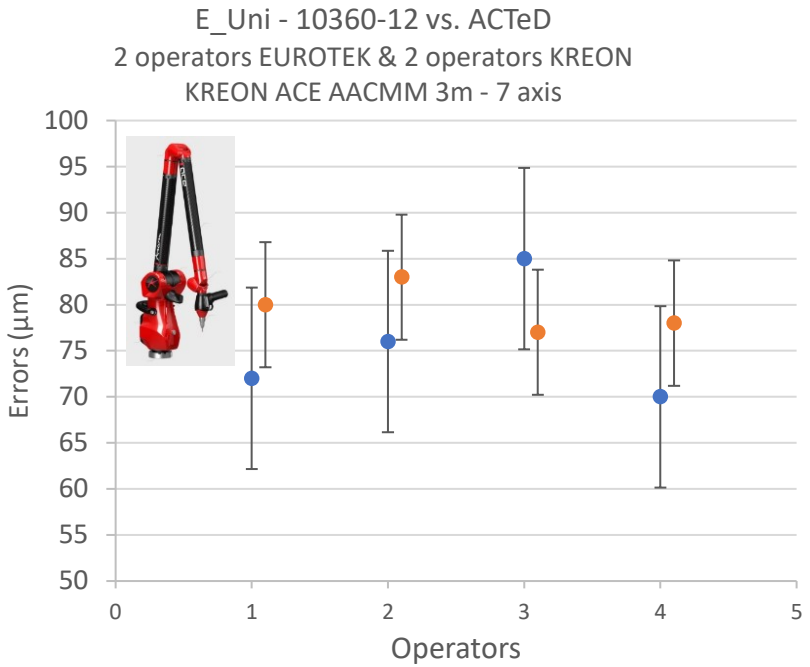
ACTeD test

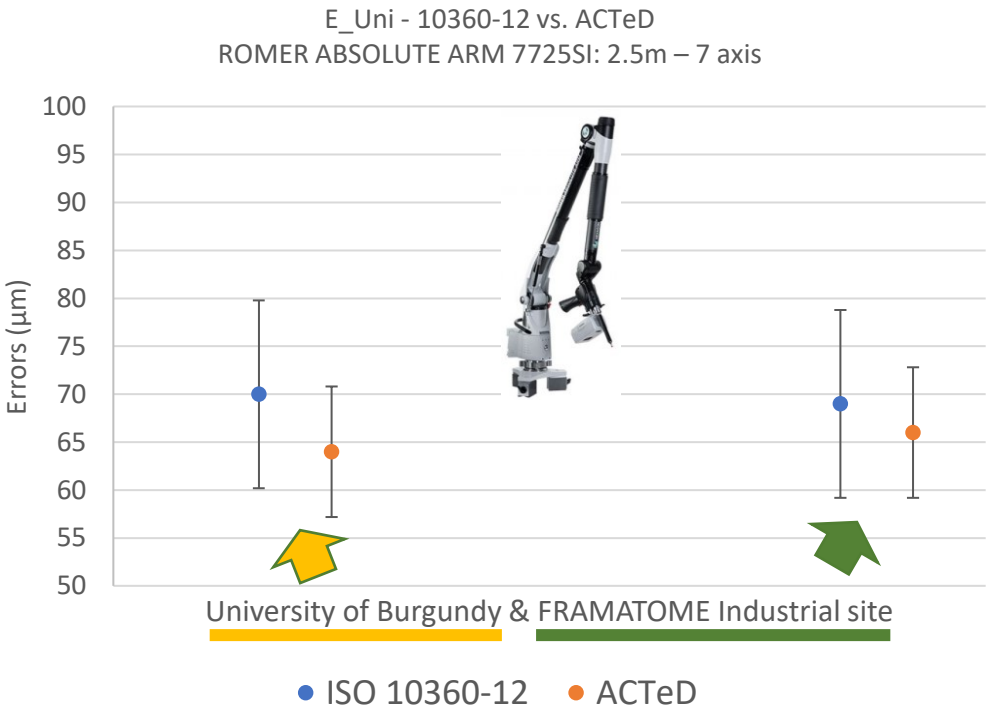
Length errors

Measure
6 lengths
in 3 positions
with 9 evaluations
(3 configurations of AACMM with 3 measurements repeatability)
by length

ACTeD test

Intercomparison Results



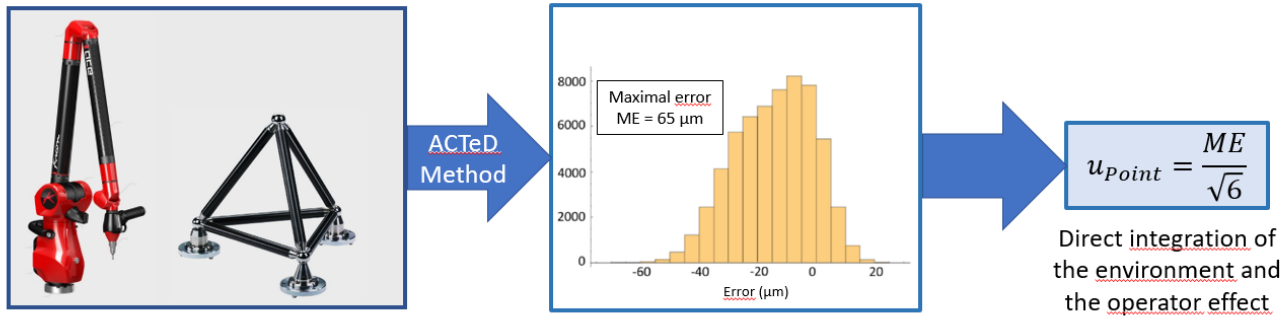


Validation with various AACMM since (all models of the KREON range + 1 FARO Arm and 2 Romer Arm)

Thanks to FRAMATOME for its participation at the beginning of this project

Conclusion Remarks & Assessment of uncertainties

- A new method is therefore available to evaluate the performance of AACMMs, in Lab. & on site
- The ISO 10360-12 standard will deserve a review
- The L_{Dia} results are not correct in the accreditation : the constant is more important than the uncertainty on this one
- With the ACTeD method, it is possible to determine the uncertainties of all mesurands (CIM2021):



- EUROTEK → cofrac For AACMM according to ISO 10360-12 & ACTeD

Thanks you for your attention !