



# Crockmeters: Standardizing Trace Sampling Methods

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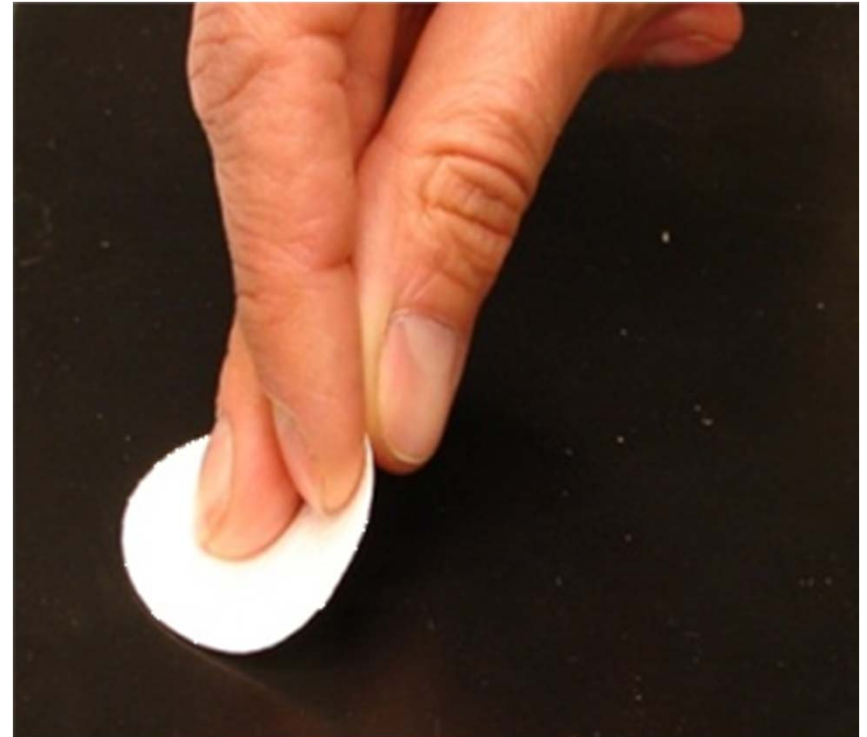
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# Crockmeter

Simply put, a crockmeter is a device widely used to determine the color fastness of textiles to dry or wet rubbing.

Crockmeters have also been used to test the color fastness to rubbing of carpets, laminates and printing inks, as well as the microscratch resistance of lacquers, coatings or painted surfaces.

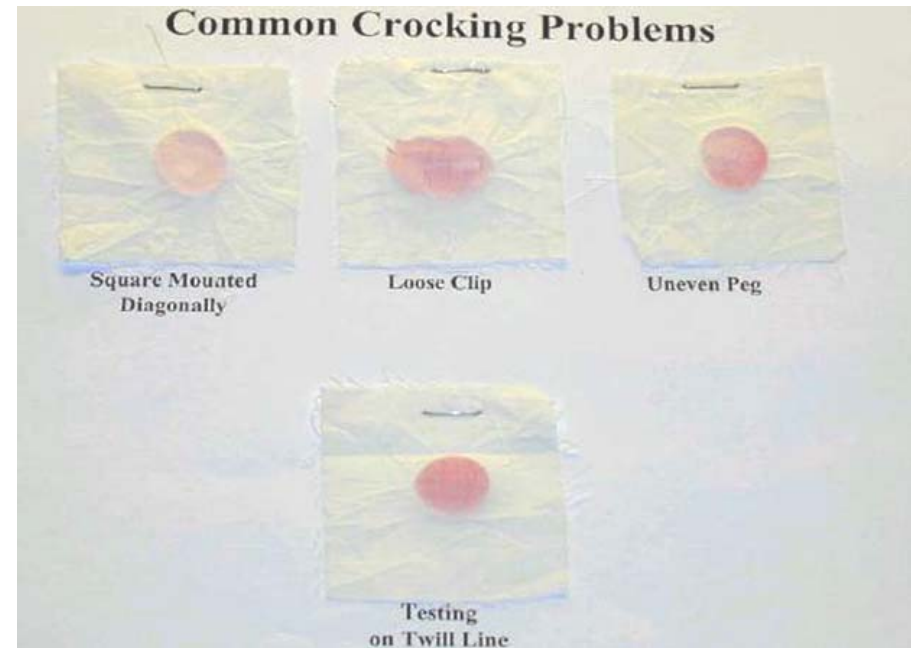


A crockmeter is also a useful tool to evaluate sampling surfaces for trace explosives residue.

# Crockmeter



Rubbing Cloth



Standard cotton fabric is rubbed against the surface of colored textile specimen to check the transfer of color.

A crockmeter essentially allows two surfaces to be rubbed against each other repeatedly with a known force.



## Crockmeter Electronic

**\$4,356.00** from Summit Measurement

Crockmeter Electronic



## Crockmeter Manual

**\$1,160.00** from Summit Measurement

Crockmeter Manual

These somewhat simple test instruments fill an textile industry niche and are not cheap.

# Trace Explosives Sampling



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It would be useful for trace sampling studies (e.g. our TESSA studies) to have a standardized methodology so that data sets can be directly compared.

A crockmeter in each lab would be optimal, but the price of the commercial units is prohibitive for many labs for such a specialty item.

**We propose the development of a low cost, open source crockmeter.**

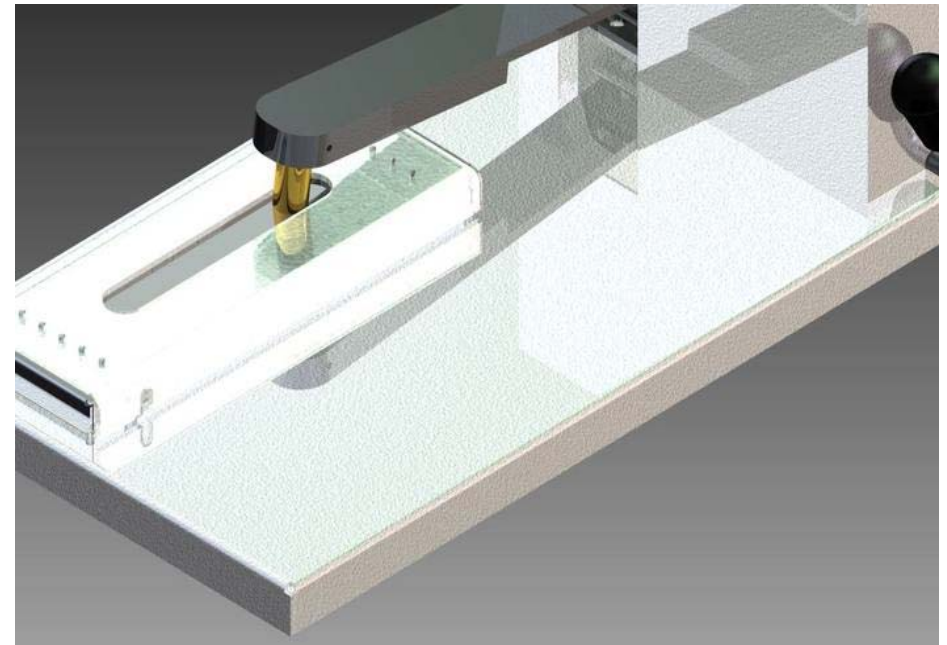
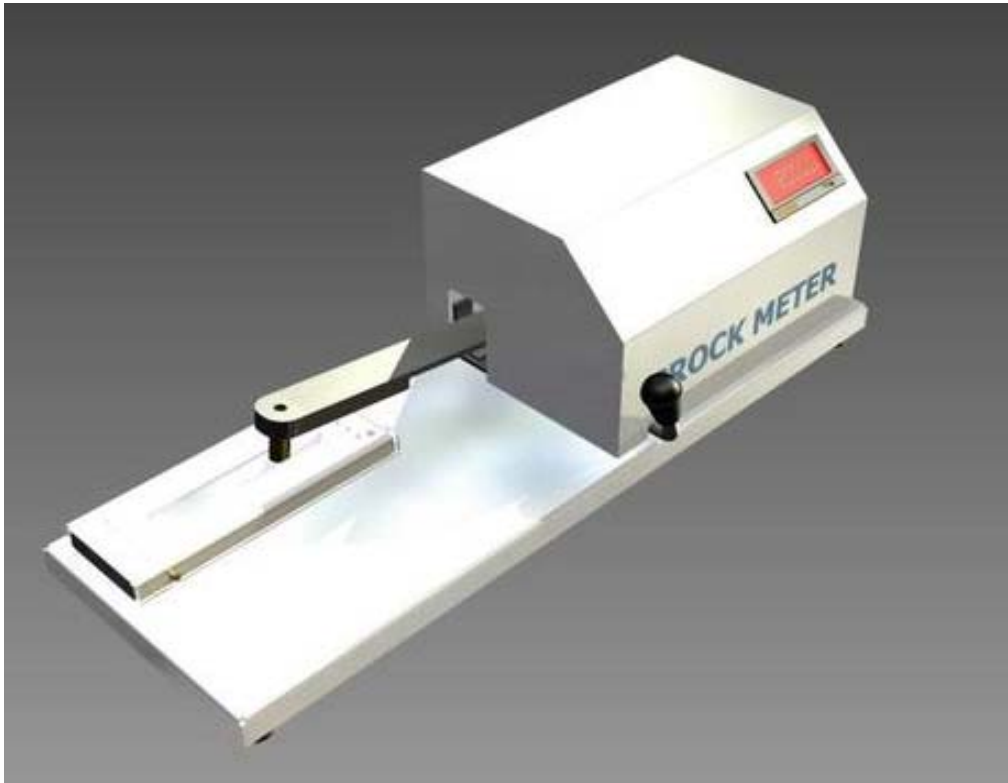
Open source promotes a universal access via a free license to a product's design or blueprint, and universal redistribution of that design or blueprint, including subsequent improvements to it by anyone.

This approach should allow for an inexpensive and uniform crockmeter design to be available to the trace sampling community.

Pearce, Joshua M (2012). "**Building Research Equipment with Free, Open-Source Hardware**". *Science* **337** (6100): 1303–4. doi:10.1126/science.1228183. PMID 22984059. open access

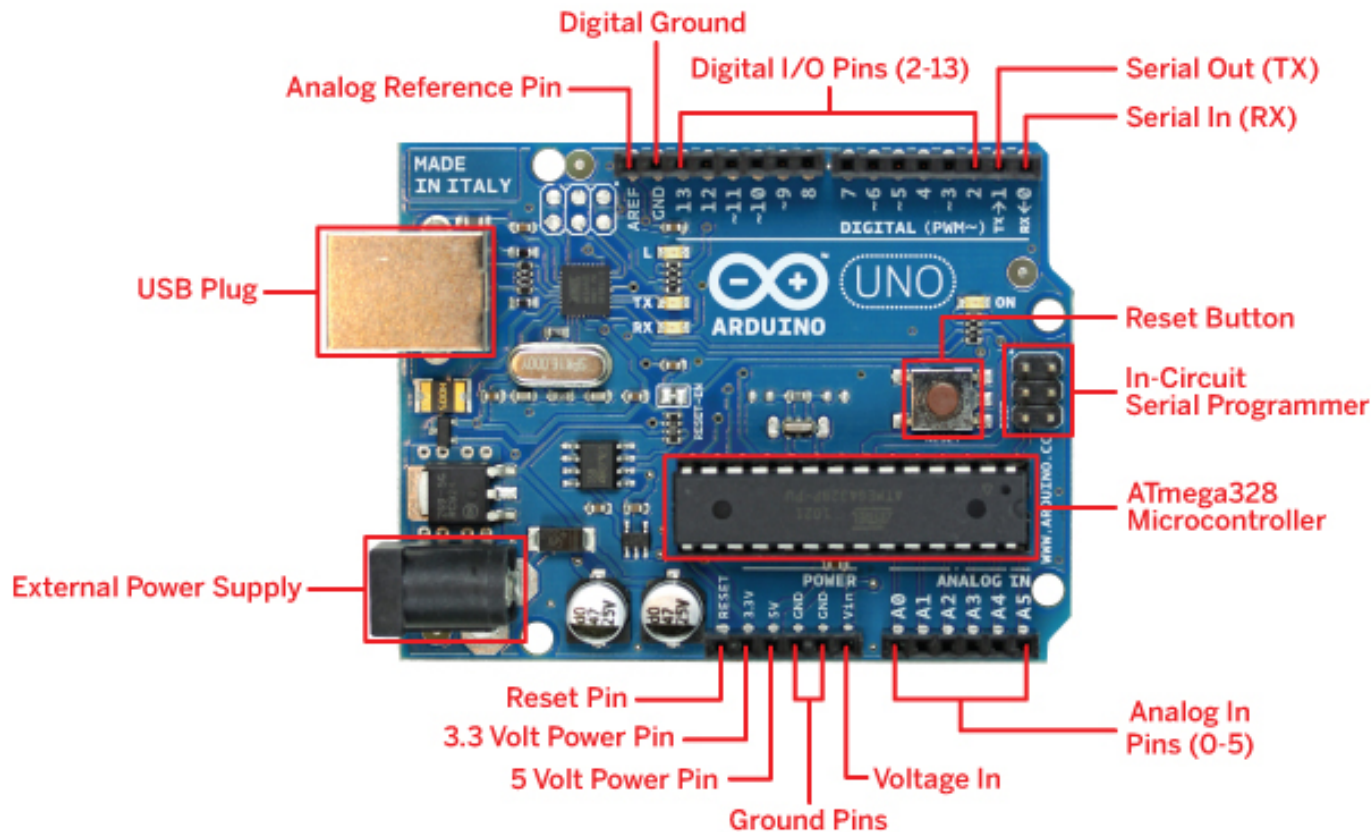
# Open Source Crockmeter

<http://www.grabcad.com/library/crockmeter-1>



# Crockmeter Automation

If we would like to further remove variables from the crockmeter operation across organizations, an open source controller could be easily designed using the Arduino platform. This is a \$25 microcontroller board with extensive I/O.



Add some low cost servo motors, and an entire low cost automated crockmeter can be built for less than \$100.



# Open Source Crockmeter



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- It makes sense to provide the community with a uniform, low cost approach for round robin sampling studies
- A open source crockmeter design would be standardized by a consensus and units could even be produced from one source
- A university engineering student with access to a 3D printer and some arduino building/programming skills should be able to build an automated crockmeter at low cost (<\$100) – this is likely any undergraduate mechanical engineering laboratory