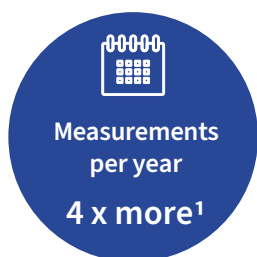


ELECTRON DIFFRACTION: COST COMPARISON

A dedicated electron diffractometer combines the best of two worlds. The perfect rotation from X-ray diffraction and the electron beam to access the sub μm -regime. The ease-of-use of ELDICO's instrumentation concept enables significantly higher efficiency in measurements: 1,600 samples per year (factor of 4 higher than on X-ray diffractometers) and a cost per sample of roughly EUR 170 (up to 69% lower compared to TEM) are strong arguments in favor of the acquisition of a proper electron diffraction device.

Our detailed cost comparison shows the unbeatable financial advantages of a dedicated electron diffractometer over traditional X-ray or 'retrofitted' (TEM)-based approaches.



THE BEST OF TWO WORLDS

The combination of proven technological principles and components from X-ray crystallography and electron microscope technology can effectively support crystallographers' need for perfect data also in the yet inaccessible sub- μm regime. The well-known bottleneck of having to grow crystals to the required size is no longer an issue.

	X-ray diffractometer	TEM	ELDICO SCIENTIFIC
Nano-sized samples	Physical barrier; no access to the sub-μm range	✓	✓
Direct method; omits the need for preparative chemistry to grow large crystals	Major bottleneck: crystal size³	✓	✓
Exclusive access to instrumentation for the crystallographer	✓	RESTRICTED⁴	✓
Diffraction mode: 'Continuous rotation'	✓	INADEQUATE	✓
Compact instrumentation	✓	SPECIAL REQUIREMENTS⁵	✓

¹ Compared to X-ray.

² Compared to TEM.

³ Large enough crystals may be not obtained at all.

⁴ Competitive with imaging applications; cannot be used without operator.

⁵ Special spatial and equipment requirements, such as ceiling height and floor carrying capacity.

COST PER MEASUREMENT¹

	X-ray diffractometer	TEM	ELDICO SCIENTIFIC
Time per measurement ²	4 hours	2 hours	1 hour
Measurements (per year) ³	400	800	1,600
Cost per measured sample	€ 423	€ 548	€ 171
Savings per measured sample in EUR ⁴	€ 252	€ 377	-
Savings per measured sample in %	58%	69%	-
Potential annual savings in EUR ⁵	€ 101,000	€ 302,000	-

¹Instrumentation and staff; example: overhead indirect cost assumed similar for all categories.

²Typical time, including preparative sample mounting, evaluation and picking.

³200 days of operation per year.

⁴Based on number of measurements; full instrumentation capacity utilized exclusively for crystallographic applications.

⁵Compared to dedicated electron diffraction with an ELDICO electron diffractometer.

INVESTMENT AND TOTAL COST OF OPERATION

All amounts in EUR	X-ray diffractometer	TEM	ELDICO SCIENTIFIC
a.) Investment			
Initial investment in hardware	300,000 – 1,000,000	1,200,000 ¹	1,800,000
Set-up & calibration ²	n/a	200,000 ³	n/a
Depreciation (10% p.a.) ⁴	30,000 – 100,000	140,000	180,000
b.) Operating cost p.a.			
Maintenance (4%)	up to 40,000	> 60,000	20,000 – 40,000
Additional staff ⁵	n/a	100,000	n/a
c.) Consumables			
	2,000 – 3,000	3,000 – 5,000	2,000 – 3,000
d.) Updates			
Hardware (1–3 years)	8,000 – 50,000 ⁶	50,000 – 300,000	10,000 – 100,000
Software (3–5 years)	5,000	20,000 – 30,000	5,000
Est. total cost of operation p.a.	169,000	439,000	274,000

¹ Lower average price assumption; investments in TEM hardware vary from EUR 0,5 M – +10 M.

² TEM requires heavy modifications and additional engineering to enable diffraction mode.

³ Additional effort needed, such as for add-ons (hardware, software) plus 2 to 3 month of 1 FTE for mechanical calibration to ED requirements.

⁴ Comparisons are based on the assumption of a 10-year operating period and linear depreciation.

⁵ Additional staff; one additional TEM operator at EUR 100k annual salary needed.

⁶ Component replacements such as slits, capillary, detector, source, etc.