



# Adolf Martens and his contribution to materials engineering



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## ABSTRACT

Adolf Martens (1850–1914) was a pioneer of materials engineering. After his studies in Berlin he joined a railway company being responsible for the technical equipment. His interest for the basic mechanisms of mechanical strength and fracture of metallic materials led him to the development of the basic concepts for metallography; his papers published between 1878 and 1889 laid the fundament of this technique. In 1880 Martens changed to the Royal Industrial Academy in Berlin and by 1884 he was designated as director of the Materials Testing Laboratory at the Technical University Berlin. Under his guidance this institution acquired an excellent reputation in all relevant areas of the German industry, forming the nucleus of the *Bundesanstalt für Materialforschung und – prüfung* (BAM) – the Federal Institute for Materials Research and Testing. Martens developed equipment in many different areas as mechanical testing of metallic materials and of paper, characterization of the wear behavior of materials and viscosity of lubricants. His overwhelming contribution to materials engineering was recognized as early as 1895 by Floris Osmond, who denominated martensite a metallographical constituent resulting from quenching of steels. In 2000 ISO designated the value obtained from the instrumented indentation method as Martens Hardness – HM.

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## 1. Adolf Martens – a short biographical sketch

Adolf Karl Gottfried Martens (Fig. 1) was born on March 6th, 1850 in Bakendorf next to Hagenow in *Großherzogtum Mecklenburg-Schwerin*, where his father was an estate tenant. Martens visited the *Realschule* (secondary school) in Schwerin. 1867 he joined the machine shop Ernst Brockelmann in Güstrow as an apprentice. From 1868 to 1871 he got his basic education as a mechanical engineer at the *Königliche Gewerbeakademie* (Royal Industrial Academy) at the Klosterstraße in Berlin (Fig. 2) [1–4].

Martens was contracted as an engineer by the *Königliche Preussische Staatseisenbahn* (Royal Prussian State Railways) in 1871 and was with the *Ostbahn* in Bromberg (today Bydgoszcz, Poland). He was then involved with the construction of the track section Berlin-Nordhausen-Wetzlar in the railway connection between Berlin and Blankenheim. Martens was responsible for the materials quality issues for rails, bridges and other structures. At this position he had an intensive contact to several steel plants as *Gutehoffnungshütte* in Westphalia and *Laurahütte* in Silesia concerning the quality of the steel products [1–4].

In 1880 Martens became an assistant of Prof. Consentius at the *Königliche Technische Hochschule, Abteilung III für Maschinen-Ingenieurwesen* (Royal Technical University, Department of Mechanical Engineering). The *Technische Hochschule*

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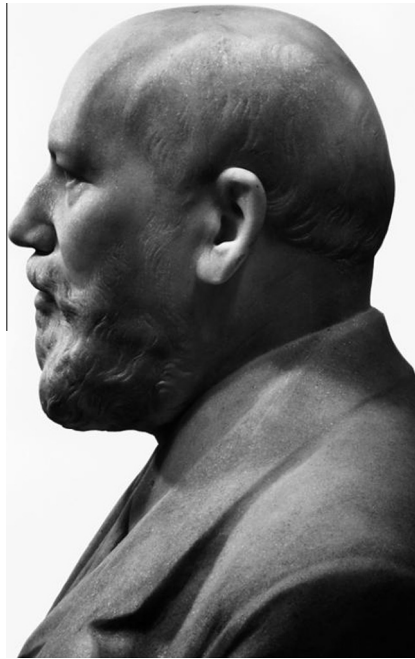


Fig. 1. Adolf Martens (1850–1914).



Fig. 2. Königliche Gewerbeakademie (Royal Industrial Academy), Klosterstraße, Berlin [7].

was created in 1879 by merging the *Gewerbeakademie* and the *Bauakademie* (Civil Engineering Academy). Martens was in charge of the courses on materials engineering [2,4,6].

On April 1st, 1884 Martens was appointed to head the *Königliche Mechanisch-Technische Versuchsanstalt* (Royal Laboratory for Mechanical Testing). This Royal Laboratory was created by the *Ministerium für Handel, Gewerbe und öffentliche Arbeiten* (Ministry of Commerce, Industry and Public Infrastructure) within the *Gewerbeakademie* in 1870; its basic mission was the continuation of the pioneering work of August Wöhler on “the behavior of metals under repeated loading” [6]. Ludwig Spangenberg was appointed as the first director of this Royal Laboratory; he was the assistant of August Wöhler in his laboratory in Frankfurt/Oder [6]. The Royal Laboratory was a small institute; Martens’ initial staff consisted of his assistant,

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