



ABSTRACT

German literature on power transformers is covered from 1888 (first book on transformers published anywhere, just three years after patenting transformers), up to most recent publications issued in 2019. The purpose of the compilation of published books on power transformers is to give a historical summary on the topic, which may also be useful to other specialists in their research.

KEYWORDS

calculation, construction, design, DIN, historical development, power transformers, testing, VDE

Books on power transformers in German - Part III

A bibliography 1952 - 2016

1952

- Gewerkschaftsbund, Wien, pages 112, 1952
- Emil Pollak, *Umwickeln elektrischer Maschinen und Transformatoren* (Wrapping electrical machines and transformers), Verlag Österreichischer
- Friedrich Weickert, *Krankheiten elektrischer Maschinen und Transformatoren* (Failure Analysis of electrical

The time from the second part of the 20th century up to the present time can be considered the era of modern transformer technology which treats the most advanced topics



machines and transformers), Ed. 11.0, Fachbuchverlag, Leipzig, pages 228, 1952

1953

VDE-Vorschriften 3. Maschinen, Transformatoren, Umformer, Installationsmaterial, Schalt- und Hochspannungsgeräte, Verbrauchsgeräte. (VDE regulations 3. Machines, transformers, converters, installation material, switching and high-voltage devices, consumer devices), Ed. 2.0, VDE-Verlag, Wuppertal u. Berlin, pages 771, 1953

1954

F. Ande, *Betrieb und Anwendung von Leistungs- und Regeltransformatoren* (Operation and application of power and

control transformers), Springer, Berlin, pages 332, 1954

1955

F. Unger, *Transformatoren* (Transformers), in books: E. V. Rziha, *Starkstromtechnik. Taschenbuch für Elektrotechniker, Band I* (Heavy current technology. Paperback for electrical engineers, Volume I), Ed. 8.0, Wilhelm Ernst & Sohn, Berlin, pp. 573–620, 1955

1956

Rudolf Küchler, *Die Transformatoren, Grundlagen für ihre Berechnung und Konstruktion* (The transformers, basics for their calculation and construction), Springer, Berlin, pages XI + 321, 1956; Ed. 2.0, pages XII + 342, 1966; reprint 2013; print on demand book, 2017

Considered as the Bible of transformer engineering in the German speaking world. Understanding the theory and application of transformers is necessary for a successful career in the electrical field, specifically in industrial fields.

The book consists of the following sections: magnetic circuit, stray fluxes, short-circuit stresses, voltage stresses, load-bearing capacity, auto-transformers, tap-changers, cooling, design of the transformer, transformer noise.

1959

F. Ande, *Die Schaltung der Leistungs-transformatoren* (The circuit of the power transformers), Springer, Berlin, pages 322, 1959

Book by Rudolf Küchler, *Die Transformatoren, Grundlagen für ihre Berechnung und Konstruktion* is considered the Bible of transformer engineering

1960

E. Breitenbruch, *Transformatoren kleiner Leistung* (Low power transformers), Friedrich Vieweg & Sohn, Braunschweig, pages 212, 1960

O. Wolf, *Durch magnetostruktive Kräfte hervorgerufene Wechselverformungen der Kerne von Drehstromtransformatoren. Dissertation.* (Variable deformations of the cores of three-phase transformers caused by magnetostrictive forces. Dissertation.), TH Hannover, 1960

1961

AEG, *Transformator-Differentialschutz (Transformator-Differentialrelais RQ 4 und Schutzrelaiskombination für Transformatoren RKT 1)* (Transformer differential protection (transformer differential relay RQ 4, and protective relay combination for transformers RKT 1), Verlag AEG, pages 26, 1961 [50, 51]

W. Baxmann, *Zur Theorie des Transformatorlärms magnetischen Ursprungs. Dissertation.* (The theory of

transformer noise of magnetic origin. Dissertation.), TH Hannover, 1961

F. Kümmler, *Regel - Transduktoren. Theorie und Anwendungen in der Regelungstechnik.* (Rules for transducers. Theory and applications in control engineering.), Springer, Berlin, pages XI + 455, 1961

František Provazník, *Probleme der Transformatoren für höchste Spannung und Leistung* (Problems of high voltage, large capacity transformers), Publisher of the Czechoslovakia Academy of Sciences, Prague, pages 144, 1961 [52]

1963

H. Reinke, *Berechnung der mechanischen Eigenfrequenzen von Drehstromkerntensformatoren. Dissertation.* (Calculation of the mechanical natural frequencies of three-phase core type transformers. Dissertation.), TH Hannover, 1963

1968

J. Reiser, *Elektrische Maschinen: I Grundlagen und Transformatoren (= Das Fachwissen des Ingenieurs)* (Electrical machines: I Basics and transformers (= The specialist knowledge of the engineer), Carl Hanser, pages 126, 1968

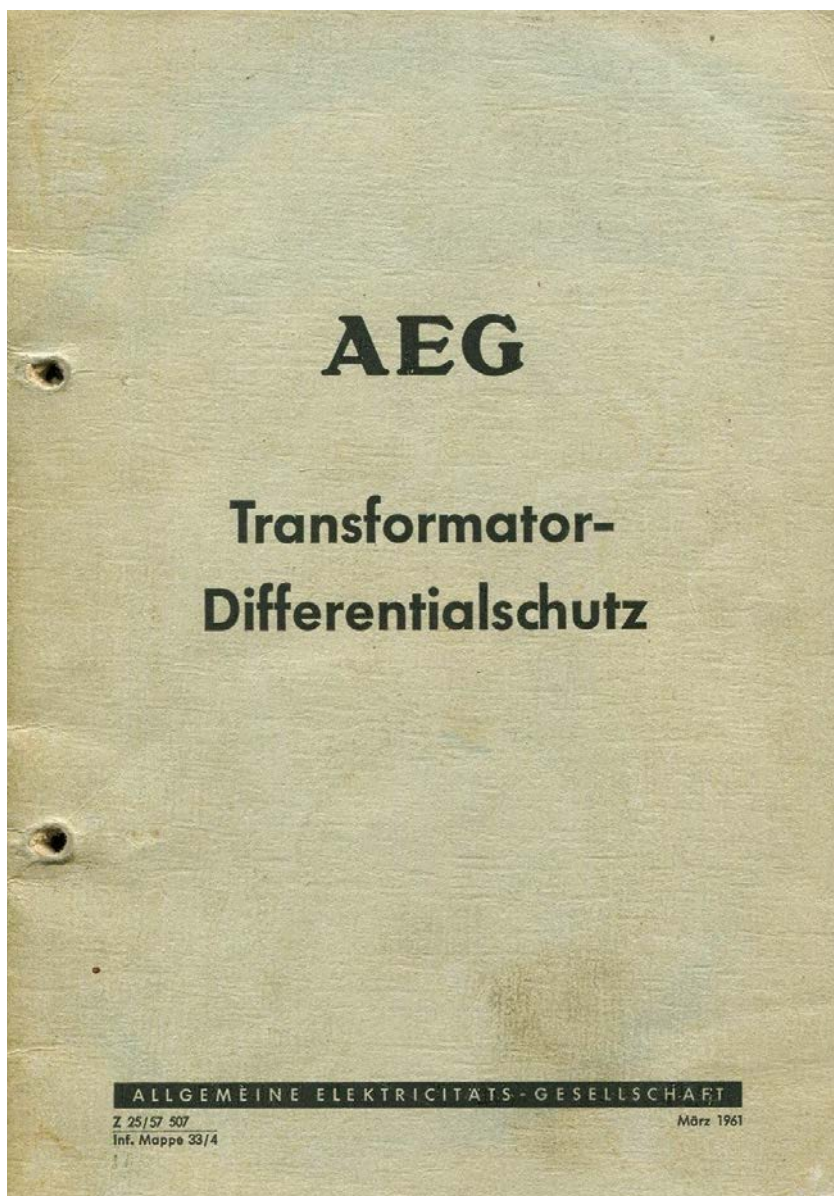
1970

F. Taegen, *Einführung in die Theorie der elektrischen Maschinen I - Transformator und Gleichstrommaschine* (Introduction to the theory of electrical machines I - Transformer and DC machine), Friedr. Vieweg & Sohn, Braunschweig, pages 197, 1970

1971

Gerhard Seifert, *Stelltransformatoren* (Variable transformers), Huthig, Heidelberg, pages 351, 1971

Horst Spanneberg, *Ruhende elektrische Maschinen - Transformatoren und Wandler - Lehrbuch für die Berufsbildung* (Electric machines - Transformers and converters - Textbook for vocational training), Ed. 7.0, VEB Verlag Technik, Berlin, pages 134, 1969; Ed. 8.0, 1971; Ed. 10.0, 1982; Ed. 14.0, 1987; Ed. 15.0, 1989 [53, 54]



1972

Heinrich Klotz, *Verfahren zur Berechnung und Entwicklung von Transformatoren* (Methods of calculation and development of transformers), Siemens, Munich, pages 32, 1972 [55]

1975

G. Aichholzer, *Elektromagnetische Energiewandler: Elektrische Maschinen, Transformatoren, Antriebe* (Electromagnetic energy converters: Electrical machines, transformers, drives), Springer, Wien, pages 860, 1975

1978

N. Boules, *Beitrag zur Berechnung kleiner Transformatoren und Gleichrichterschaltungen. Dissertation.* (Contribution to the calculation of small transformers and rectifier circuits. Dissertation.), TUBraunschweig, pages 171, 1978 [56]

Wolfgang Hinze et al., *Stromversorgungsanlagen militärischer Nachrichtengeräte Teil 1 - Verbrennungskraftmaschinen, Transformatoren und elektrische Maschinen* (Power supply systems for military communications equipment Part 1 - Internal combustion engines, transformers and electrical machines), Militärverlag, Berlin, pages 162, 1978

1982

Jurgen Goldnau, Edgar Suss, *Transformatoren: Transformatorstationen für Abnehmer - Planen, Errichten, Betreiben* (Transformers: Transformer stations for customers - planning, building, operating), German publishing house for basic material industry, Leipzig, pages 222, 1982 [57]

D. J. Kraaij, G. S. Schemel, F. M. Wegscheider, *Die Pruefung von Leistungs-Transformatoren* (Testing of power transformers), Book publisher electrical engineering, Aarau / Switzerland, pages 100, 1983 [58]

1986

Werner Dietrich, *Transformatoren: Stand der Technik und Tendenzen* (Transformers: State of the art and trends), VDE-Verlag, Berlin, pages 382, 1986

www.transformers-magazine.com

Literature topics from the 1950s to 1980s shaped the modern technology of the transformers we know today



1987

Dieter Nährmann, *Stromversorgungs-Praxis: Transformatoren, Gleichrichter- und Stabilisierungsschaltungen* (Power supply practice: Transformers, rectifiers and stabilisation circuits), Franzis, Munich, pages 232, 1987 [59]

1990

Gregor D. Häberle, Heinz O. Häberle, *Transformatoren und elektrische Maschinen: In Anlagen der Energietechnik. Bibliothek des Technikers.* (Transformers and electrical machines: In energy technology systems. Technician's library.), Ed. 2.0, Verlag Europa-Lehrmittel, Haan-Gruiten, pages 286, 1990 [60]

1991

Wilfried Weißgerber, *Elektrotechnik für Ingenieure 2: Wechselstromtechnik, Ortskurven, Transformator, Mehrphasensysteme. Ein Leh- und Arbeitsbuch für das Grundstudium.* (Electrical engineering for engineers 2: AC technology, locus curves, transformer, multi-phase systems. A teaching and workbook for basic studies.), Vieweg & Sohn, Braunschweig, 1991; Ed. 2.0, 1993; Ed. 3.0, 1996; Ed. 4.0, pages VIII + 372, 1999; Ed. 7.0, 2009; Ed. 8.0, 2012 [61, 62]

1993

Rudolf Janus, *Transformatoren* (Transformers), VDE-Verlag, Berlin, pages 188, 1993 [63]

1997

H. Vosen, *Kühlung und Belastbarkeit von Transformatoren: Erläuterungen zu DIN VDE 0532, VDE - Schriftenreihe Nr. 72* (Cooling and resilience of transformers: Explanations of DIN VDE 0532, VDE - series No. 72), VDE Verlag, pages 192, 1997

2001

Ebrahim Rahimpour, *Hochfrequente Modellierung von Transformatoren zur*

Berechnung der Übertragungsfunktion (High frequency modeling of transformers to calculate the transfer function), Shaker Verlag, Stuttgart, pages 153, 2001 [64-66]

2002

Jochem Christian, *Erkennung mechanischer Wicklungsschäden in Transformatoren mit der Übertragungsfunktion* (Detection of mechanical winding damage in transformers using the transfer function), Shaker Verlag, pages 156, 2002 [67]

2005

Hermann J. Abts, *Verteil-Transformatoren / Distribution-Transformers*, Heidelberg Hüthig, pages 196, 2006; Ed. 2.0, VDE Verlag, Berlin, pages 206, 2017 (bilingual book)

Robert Janus, Hermann Nagel, *Transformatoren* (Transformers), Ed. 2.0, VDE Verlag, Berlin, pages 80, 2005

2007 [68-70]

Michael Meinert, *Hohachtemperatur-supraleitende Transformatoren für künftige Schienenfahrzeuge* (High-tem-



Weißgerber's Elektrotechnik für Ingenieure 2 (Electrical engineering for engineers 2) is an excellent teaching textbook and workbook that covers the basics of transformer's technology

perature superconducting traction transformers for future rail vehicles), Shaker Verlag, Aachen, pages 346, 2007

2008

Gerhard Herold, *Elektrische Energieversorgung 2: Parameter elektrischer Stromkreise, Leitungen, Transformatoren* (Electrical energy supply 2: Parameters of electrical circuits, lines, transformers), Ed. 2.0, Schlemmbach, Wilburgstetten, pages 564, 2008

2009

Ulrich Wagner, *Elektrische Kraftwerkstechnik 1: Generatoren, Transformatoren, Eigenbedarfsanlagen, Schutzrichtungen; Vorlesungsskript* (Electrical power plant technology 1: Generators, transformers, own requirements, protective devices; Lecture script), Ed. 5.0, Technical University of Munich, pages 177, 2009 [71]

2010

Peter Baier, *Dreiphasen-Leistungstransformatoren - Magnetisierungserscheinungen, Harmonische, Betriebsvorgänge, Stell- und Stromrichtertransformatoren* (Three-phase power transformers - magnetisation phenomena, harmonics, operations, actuators and converter transformers), VDE Verlag, Berlin, Pages 204, 2010 [72, 73]

2011

André Berger, *Entwicklung supra-leitender, strombegrenzender Transformatoren; Dissertation*; (Development of superconducting, current-limiting transformers; Dissertation), KIT Scientific Publishing, Karlsruhe, pages 163, 2011 [74]

2014

Bernd Aschendorf, *FEM bei elektrischen Antrieben 1: Grundlagen, Vorgehens-*

weise, Transformatoren und Gleichstrommaschinen (FEM for electrical drives 1: Basics, procedure, transformers and DC machines), Vieweg & Teubner Verlag, Wiesbaden, pages 529, 2014 [75]

Leonhard Stiny, *Elektrotechnik für Studierende: Wechselstrom 2 - Ortskurven, Mehrphasensysteme, Transformatoren und Übertrager - Band 4* (Electrical engineering for students: AC 2 - locus, multi-phase systems, transformers and heat exchangers - Volume 4), Verlag Christiani, pages 256, 2014 [76]

2016

Joh. Shlenker-Maier, *ISMET Transformatoren 290* (ISMET Transformers 290), Joh. Shlenker-Maier, Schweningen, pages 88, 2016 [77]

Frank Zinecker, *Optimierung eines Tesla-Transformators - Methoden und Anwendungen* (Optimisation of a Tesla transformer - methods and applications), AV Akademikerverlag, pages 56, 2016 [78, 79]

Conclusion

While working on the bibliography, the authors tried to compile a historical summary of the published books on power transformers in German language and did not pursue commercial goals. They hope that the bibliography will be useful to other specialists in their research, and also may create awareness among new-generation engineers of the path we have travelled so far.

Bibliography

[50] <https://www.booklooker.de/B%-C3%BCcher/Angebote/autor=AEG>, current on 7 May, 2020

[51] <https://www.booklooker.de/B%-C3%BCcher/Angebote/titel=Transformator-Differentialschutz->

[+Transformator-Differentialrelais+RQ+4+und+Schutzrelaiskombination+f%C3%BCr+Transformatoren](#), current on 7 May, 2020

[52] <https://www.tib.eu/de/suchen/id/TIBKAT%3A214440451/Probleme-der-Transformatoren-f%C3%BCr-h%C3%B6chste-Spannung/>, current on 7 May, 2020

[53] <https://www.booklooker.de/B%-C3%BCcher/Angebote/autor=H+-Spanneberg>, current on 7 May, 2020

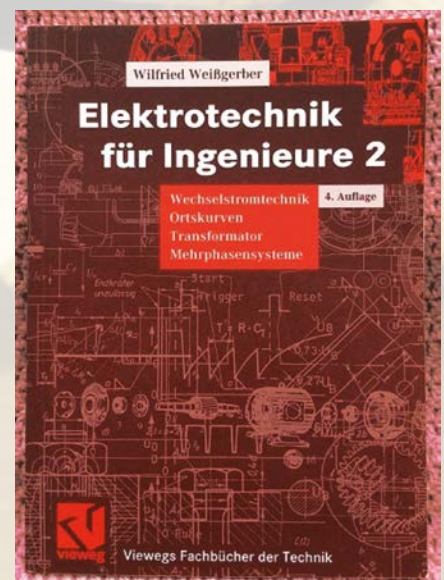
[54] <https://www.booklooker.de/B%-C3%BCcher/Angebote/titel=Ruhende+elektrische+Maschinen++Transformatoren+und+Wandler+-Lehrbuch+f%C3%BCr+die+Berufsbildung>, current on 7 May, 2020

[55] <https://www.tib.eu/de/suchen/id/TIBKAT%3A054286859/Verfahren-zur-Berechnung-und-Entwicklung-von-Transformatoren/>, current on 7 May, 2020

[56] <https://vufind.techlib.cz/Record/000154588/Details>, current on 7 May, 2020

[57] <https://www.booklooker.de/B%-C3%BCcher/Angebote/titel=Transformatoren+Transformatorstationen+f%C3%BCr+Abnehmer+-Planen+Errichten+Betreiben>, current on 7 May, 2020

[58] https://books.google.com.ua/books/about/Die_Pr%C3%BCfung_von_Leistungs_Transformator.html?id=-



[FmZpHwAACAAJ&redir_esc=y](#), current on 7 May, 2020

[59] https://www.abebooks.de/servlet/SearchResults?an=n%FChrmann%20dieter&cm_sp=det- -bdp- -author, current on 7 May, 2020

[60] https://books.google.com.ua/books/about/Transformatoren_und_elekt_rische_Maschine.html?id=OjaitgAA-CAAJ&redir_esc=y, current on 7 May, 2020

[61] <https://www.booklooker.de/B%C3-%BCcher/Angebote/autor=Wilfried-+Wei%C3%9Fgerber>, current on 7 May, 2020

[62] <https://www.booklooker.de/B%-C3%BCcher/Angebote/titel=Elektrotechnik+f%C3%BCr+Ingenieure+2+Wechselstromtechnik+Ortskurven+Transformator+Mehrphasensysteme>, current on 7 May, 2020

[63] <https://www.amazon.com/Transformatoren-Rudolf-Janus/dp/3800719630>, current on 7 May, 2020

[64] <https://www.booklooker.de/B%-C3%BCcher/Angebote/autor=Ebrahim+Rahimpour>, current on 7 May, 2020

[65] <https://www.booklooker.de/B%-C3%BCcher/Angebote/titel=Hochfrequente+Modellierung+von+Transformatoren+zur+Berechnung+der+%C3%9Cbertragungsfunktion>, current on 7 May, 2020

[66] <https://www.booklooker.de/B%-C3%BCcher/Angebote/verlag=Shaker+Verlag>, current on 7 May, 2020

[67] <https://www.amazon.com/Erkennung-mechanischer-Wicklungssch%C3%A4den-Transformatoren-%C3%9Cbertragungsfunktion/dp/3832204806>

[68] <https://www.booklooker.de/B%-C3%BCcher/Angebote/autor=Janus+Rudolf%3B+Nagel+Hermann>, current on 7 May, 2020

[69] <https://www.booklooker.de/B%C3-%BCcher/Angebote/titel=Transformatoren>, current on 7 May, 2020

[70] <https://www.booklooker.de/B%C3-%BCcher/Angebote/verlag=VDE+VERLAG>, current on 7 May, 2020

Some of today's hot topics in the German transformer related literature include analysis, design or optimisation of transformers using FEM as well as the development of superconducting transformers

[71] <http://mediatum.ub.tum.de/node?-id=829413>, current on 7 May, 2020

[72] <https://www.booklooker.de/B%C3-%BCcher/Angebote/autor=Peter+Baier>, current on 7 May, 2020

[73] <https://books.google.com.ua/books?id=irZpPgAACAAJ&dq=Dreiphasen-Leistungstransformatoren++Magnetisierungerscheinungen&hl=uk&sa=X&ved=0ahUKEwjW0rDCaPpAhXQAxAIHfjwB-7MQ6AEIKjAA>, current on 7 May, 2020

[74] <https://www.ksp.kit.edu/978386644-6373>, current on 7 May, 2020

[75] <https://www.abebooks.de/servlet/SearchResults?an=aschendorf%20ber->

[nd&cm_sp=det- -bdp- -author](#), current on 7 May, 2020

[76] https://www.abebooks.de/servlet/SearchResults?an=leonhard%20stiny&cm_sp=det- -bdp- -author, current on 7 May, 2020

[77] <https://www.booklooker.de/B%C3-%BCcher/Angebote/titel=ISMET-+Transformatoren+290>, current on 7 May, 2020

[78] <https://www.booklooker.de/B%C3-%BCcher/Angebote/titel=Optimierung+eines+Tesla-Transformators>, current on 7 May, 2020

[79] <https://www.booklooker.de/B%C3-%BCcher/Angebote/verlag=AV+Aka-demikerverlag>, current on 7 May, 2020

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Vitaly Gurin graduated from Kharkov Polytechnic Institute (1962) and graduate school at the Leningrad Polytechnic Institute. Candidate of technical sciences in the Soviet scientific system (1970). For 30 years he tested transformers up to 1.150 kV at ZTZ, including the largest one of that time in Europe, and statistically analysed the test results. For over 25 years he was the Executive Director of Trafoservis Joint-Stock Company in

Sofia (the diagnosis, repair and modernisation in the operating conditions of transformers 20 – 750 kV). He has authored about 150 publications in Russian and Bulgarian, and is the main co-author of GOST 21023.



P. Ramachandran started his career in transformer industry in 1966 at TELK, Kerala, a Hitachi Joint venture, in India. He worked with ABB India during 1999-2020. He has more than 50 years of experience in the design and engineering of power products including power transformers, bushings, and tap-changers. He received Bachelor of Science Degree in Electrical Engineering from the University of Kerala, India, and Master of Business Administration Degree from Cochin University, India. He is a Fellow of Institution of Engineers (India), and he represented India in CIGRE Study Committee A2 for transformers during 2002 – 2010.