

Menachem Kimchi · David H. Phillips

Resistance Spot Welding

Fundamentals and Applications
for the Automotive Industry

Second Edition

Synthesis Lectures on Welding Engineering

Series Editors

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David H. Phillips, Columbus, USA

This series publishes short books on fundamentals, principles, and applications on a variety of Welding Engineering topics including spot welding, solid-state welding, a guide to navigating welding codes, computational modelling of welds and welding processes, laser welding, arc welding automation and control, and micro-joining. Initial topics have been chosen because they are either not well represented by the current market of published material, and/or similar publications are outdated and do not represent the latest welding advancements, knowledge, and technology.

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Synthesis Lectures on Welding Engineering
ISBN 978-3-031-25782-7 ISBN 978-3-031-25783-4 (eBook)
<https://doi.org/10.1007/978-3-031-25783-4>

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The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

This book was written by two professors in the Welding Engineering program at Ohio State University in response to the rapidly increasing challenge for Resistance Spot Welding the many families of advanced materials in the modern automotive industry. The aggressive implementation of these materials is driven by the ongoing need to develop vehicles that are lighter weight (for better fuel efficiency) and safer to drive. Both goals rely heavily on stronger, lighter weight materials. In particular, modern steels known as “advanced high-strength steels” are rapidly becoming integral to automotive construction. This family of steels offers an excellent combination of high strength and ductility. The high strength of these materials allows for the use of thinner sheets and structures to reduce weight, as well as to provide improved crash protection in certain parts of the car. Aluminum alloy applications are increasing as well, primarily due to their excellent strength-to-weight ratio. Even advanced aluminum alloys that previously were used primarily for aerospace applications are being considered.

To successfully implement these materials, in many cases they will have to be spot welded, a welding process that the automotive industry relies heavily on to keep vehicle costs relatively low. Whereas resistance spot welding of plain carbon steels is well established and well understood, advanced high-strength steels and aluminum alloys present many new challenges to the welding engineer. To date, there is no textbook that covers these specific topics, and the coverage of the resistance spot welding process in general is limited. The intent of this book is to fill in some of those gaps.

Columbus, USA

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David H. Phillips

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Dr. David H. Phillips is a Professor of Practice in the Welding Engineering program at The Ohio State University. After completing his Master's degree in Welding Engineering in 1986, he spent approximately 20 years in industry, with most of his experience in the aerospace and automotive sectors. David then earned his Ph.D. in Welding Engineering and began teaching at Ohio State in 2008 where he now teaches a variety of welding processes and weld metallurgy courses from sophomore to graduate level. David is a licensed Professional Engineer (P.E.) in Welding Engineering, an International Welding Engineer (I.W.E.), and was a Certified Welding Inspector (C.W.I.) for 12 years. He is also the author of a recently published textbook titled *Welding Engineering: An Introduction*.