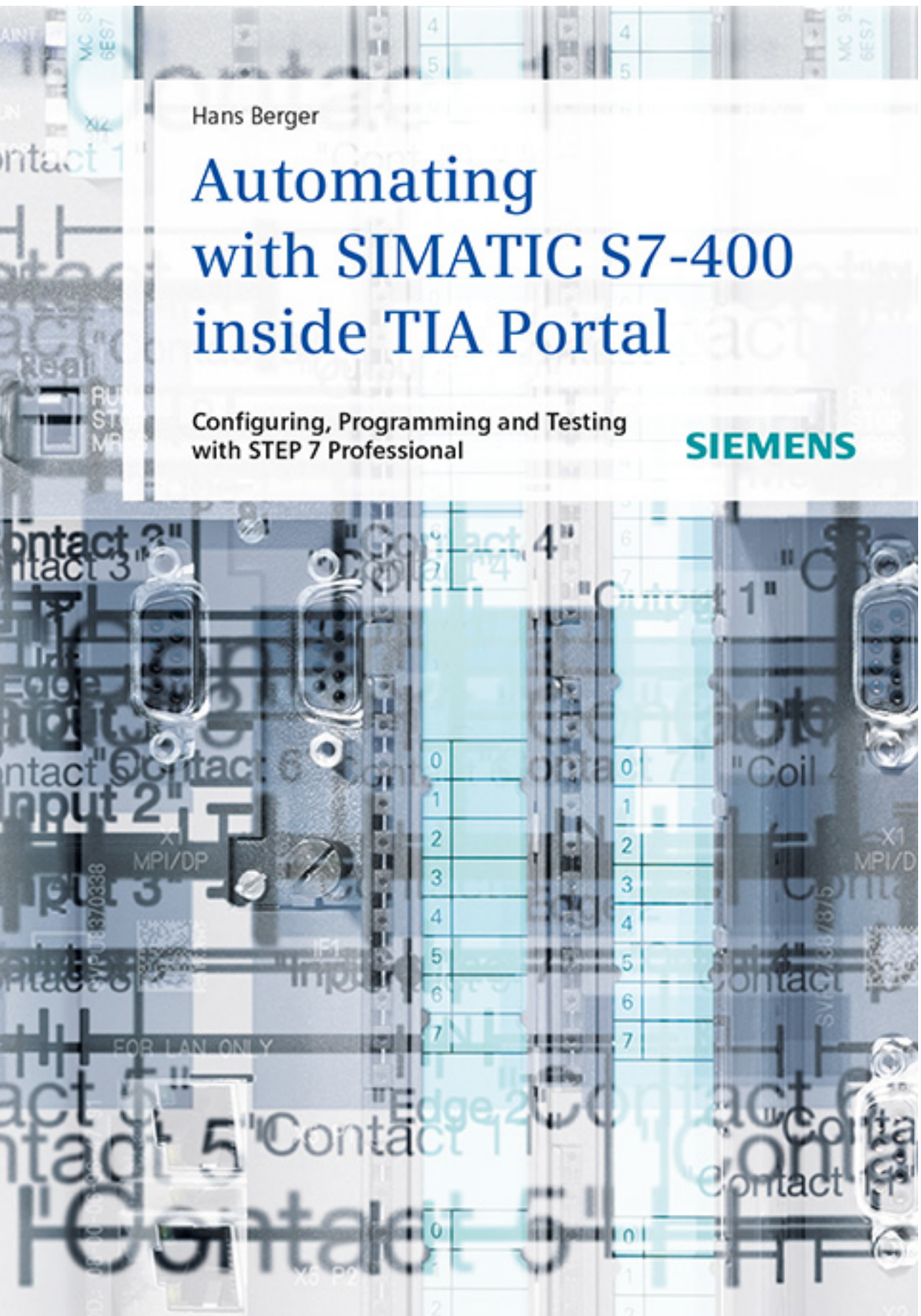

Hans Berger

Automating with SIMATIC S7-400 inside TIA Portal

Configuring, Programming and Testing with STEP 7 Professional

SIEMENS

Berger
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Publicis Publishing

Bibliographic information from the Deutsche Nationalbibliothek

The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data are available on the Internet at http://dnb.d-nb.de.

www.publicis-books.de

ISBN 978-3-89578-383-8

Editor: Siemens Aktiengesellschaft, Berlin and Munich
Publisher: Publicis Publishing, Erlangen

Printed in Germany

Preface

The SIMATIC automation system unites all the subsystems of an automation solution under a uniform system architecture to form a homogenous whole from the field level right up to process control.

The *Totally Integrated Automation* (TIA) concept permits uniform handling of all automation components using a single system platform and tools with uniform operator interfaces. These requirements are fulfilled by the SIMATIC automation system, which provides uniformity for configuration, programming, data management, and communication.

This book describes the hardware components of the SIMATIC S7-400 automation system with standard controllers, and the features provided for designing a distributed control concept with PROFIBUS and PROFINET. To permit communication with other automation systems, the controllers offer integrated bus interfaces for multipoint interface (MPI), PROFIBUS, and Industrial Ethernet.

The STEP 7 Professional engineering software makes it possible to use the complete functionality of the S7-400 controllers. STEP 7 Professional is the common tool for hardware configuration, generation of the user program, and for program testing and diagnostics.

STEP 7 Professional provides five languages for generation of the user program: Ladder logic (LAD) with a graphic representation similar to a circuit diagram, function block diagram (FBD) with a graphic representation based on electronic circuitry systems, statement list (STL) with formulation of the control task as a list of commands at machine level, a high-level Structured Control Language (SCL) similar to Pascal, and finally GRAPH as a sequencer with sequential processing of the user program.

STEP 7 Professional supports testing of the user program by means of watch tables for monitoring, control and forcing of tag values, by representation of the program with the current tag values during ongoing operation, and by offline simulation of the programmable controller.

This book describes the configuration, programming, and testing of the S7-400 automation system with the STEP 7 Professional engineering software Version 11 with Service Pack 4.

Erlangen, June 2013 Hans Berger

The contents of the book at a glance

Start

Overview of the SIMATIC S7-400 automation system.

Introduction to the SIMATIC STEP 7 Professional V11 engineering software.

The basis of the automation solution: Creating and editing a project.

SIMATIC S7-400 automation system

Overview of SIMATIC S7-400 modules: Design of an automation system, CPUs, signal, function and communication modules.

Device configuration

Configuration of a station, parameterization of modules, and networking of stations.

Tags, addressing, and data types

The properties of inputs, outputs, I/O, bit memories, data, and temporary local data as operand areas, and how they are addressed: absolute, symbolic, and indirect.

Description of elementary and compound data types, data types for block parameters, pointers, and user data types.

Program execution

How the CPU module responds in the STARTUP, RUN, and STOP modes.

How the user program is structured with blocks, what the properties of these blocks are, and how they are called.

How the user program is executed: startup characteristics, main program, interrupt processing, troubleshooting, and diagnostics.

The program editor

Working with the PLC tag table, creating and editing code and data blocks, compiling blocks, and evaluating program information.

The ladder logic programming language LAD

The characteristics of LAD programming; series and parallel connection of contacts, the use of coils, standard boxes, Q boxes, and EN/ENO boxes.

The function block diagram programming language FBD

The characteristics of FBD programming; boxes for binary logic operations, the use of standard boxes, Q boxes, and EN/ENO boxes.

The statement list programming language STL

The characteristics of STL programming; programming of binary logic operations, application of digital functions, and control of program execution.

The structured control language SCL

The characteristics of SCL programming; operators and expressions, working with binary and digital functions, control of program execution using control statements.

The S7-GRAPH sequential controller

What a sequential control is, and what its elements are: sequencers, steps, transitions, and branches. How a sequential control is configured using S7-GRAPH.

Description of the control functions

Basic functions: Functions for binary signals: binary logic operations, memory functions, edge evaluations, SIMATIC and IEC timer and counter functions.

Digital functions: Functions for digital tags: transfer, comparison, arithmetic, math, conversion, shift, and logic functions.

Program flow control: Working with status bits, programming jump functions, calling and closing blocks, using the master control relay.

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Connecting a programming device to the PLC station, switching on online mode, transferring the project data, and protecting the user program.

Loading, modifying, deleting, and comparing the user blocks.

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How a PROFIBUS DP master system is configured, and what properties it has.

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The properties of S7 basic communication and of S7 communication, and with what communication functions they are programmed.

The communication functions used to implement open user communication.

How PtP communication is implemented.

Annex

How external source files are created and imported for STL and SCL blocks.

How a project created using STEP 7 V5.x is migrated to the TIA Portal.

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