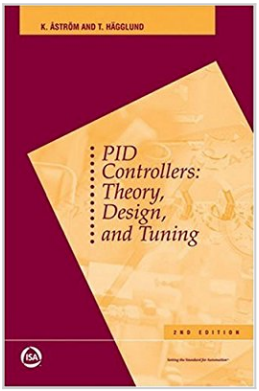

PID Controllers: Theory, Design, and Tuning

By Tore Hagglund

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This book provides users and manufacturers of PID controllers, as well as educators, with a better understanding of PID control. This second edition takes stock of new developments in digital PID controllers. Modeling methods, implementation details, and problem-solving techniques are presented to help you improve loop performance and product quality.

The book examines the auto-tuning and adaptation features of several commercial controllers and it discusses measures for dealing with specific challenges such as reset windup, long process dead times, and oscillatory systems. Design methods and tuning rules that consider factors such as load disturbances, measurement noise, model uncertainty, and set point response are also recommended.

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Editorial Review

About the Author
KARL J. ÅSTRÖM, PH.D., is a veteran scientist, engineer, and teacher in the area of automatic control. He was educated at the Royal Institute of Technology in Stockholm, Sweden, where he received a M.Sc. in Engineering Physics and a Ph.D. in Automatic Control and Mathematics. Among his many accomplishments in teaching and research, he worked on inertial guidance for the Research Institute of National Defense in Stockholm where, together with F. Hector of Philips, he developed a new principle for Schuler tuning of an inertial platform that was successfully flight tested. In the early 1960s he joined the IBM Nordic Laboratory to work on theory and applications of computerized process control. He later worked on optimal and stochastic control as a visiting scientist at IBM Research Laboratories in Yorktown Heights and San Jose. Upon his return to Sweden, Åström was responsible for modeling, identification, and implementation of systems for the computer control of paper machines. Åström later accepted an appointment as Professor to the Chair of Automatic Control at Lund Institute of Technology/University of Lund. Åström has served as Dean of the Department of Engineering Physics and Chairman of the Computing Board at Lund University in Sweden, and he has held visiting appointments at universities in the United States, Europe, and Asia.

The holder of three patents, Åström is an editor of the journal Automatica. He has written five books and many papers. He is a fellow of the IEEE, a member of the Royal Swedish Academy of Sciences and the Royal Swedish Academy of Engineering Sciences (IVA). He is also a foreign associate of the U.S. National Academy of Engineering. Åström has received many awards, among them the Rufus Oldenburger Medal from ASME in 1985, the Quazza medal from IFAC in 1987, the IEEE Control Systems Science and Engineering Award in 1990, and the IEEE Medal of Honor "for fundamental contributions to theory and applications of adaptive control technology" in 1993.

TORE HÄGGLUND, PH.D., is a professor in the Department of Automatic Control at the Lund Institute of Technology in Lund, Sweden. He holds an M.S. in Engineering Physics and a Ph.D. in Automatic Control, both from the Lund Institute of Technology. During his Ph.D. studies that focused on adaptive control and fault detection, he and Dr. Karl J. Åström developed the relay autotuner for automatic tuning of PID controllers. The method was patented and is now implemented in many industrial products. After completing his studies, Dr. Hägglund joined SattControl Instruments (now ABB) where he implemented automatic tuning methods and developed new industrial adaptive controllers.

Upon completion of his work at SattControl Instruments, he returned to the Department of Automatic Control at Lund Institute of Technology where his research in process control, adaptive control, and fault detection has resulted in a new dead-time compensting controller, methods for supervision of PID controllers and automatic detection of friction in valves, and a method to compensate for static friction in control valves. These methods have also been implemented in industrial products.

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