
SENSOR TECHNOLOGY

Components of Automation Technology

3rd Edition

© hps SystemTechnik

Lehr- + Lernmittel GmbH

Altdorfer Strasse 16
88276 Berg (Germany)

Telephone: +49 751 / 5 60 75-70
Fax: +49 751 / 5 60 75 77
Internet: <http://www.hps-SystemTechnik.com>
E-mail: vertriebberg@hps-systemtechnik.com

Order no.: V 0140

All rights reserved. No part of this publication may be reproduced, transmitted, stored in a retrieval system, nor translated into any human or computer language, in any form or by any means, electronic, mechanical, magnetic, optical, chemical, manual or otherwise, without the prior permission of hps SystemTechnik.

List of Contents

1	Operation of the SENSORICS BOARD	1	5.2	Experiments	43
1.1	General	1	6	Inductive Analog Sensors	47
1.2	Segment Disk	1	6.1	Fundamentals	47
1.2.1	Motor Control	1	6.1.1	Structure and Function	47
1.2.2	Mounting the Material Sample Holder	1	6.2	Experiments	48
1.3	Carriage	2	7	Ultrasonic Sensors	51
1.3.1	Manual Drive	2	7.1	Fundamentals	51
1.3.2	Electrical Drive	2	7.1.1	Transmission and Reflection at Boundary Areas	51
1.3.3	Sensor Control	2	7.1.2	Sound Waves in Air	52
1.3.4	Mounting the Sensors	2	7.1.3	Generation of Ultrasound in Air	52
1.4	Electronic Counter / Frequency Meter	3	7.1.4	Ultrasonic Transmitter	54
1.5	Material Sample Holder and Sensors	4	7.1.5	Ultrasonic Receiver	55
1.5.1	Positioning of the Material Sample	4	7.1.6	Operation as a Proximity Switch	55
1.5.2	Positioning of the Sensor	4	7.1.7	Axial Approach	57
1.6	Supply and Indication Field	4	7.1.8	Radial Approach	57
			7.1.9	Switching Hysteresis	57
2	Inductive Sensors	5	7.2	Experiments	58
2.1	Fundamentals	5	8	NAMUR Sensors	63
2.1.1	Structure and Function	5	8.1	Fundamentals	63
2.1.2	Rated Switching Distance	6	8.2	Experiments	65
2.1.3	Reduction Factor	6	9	Fibre Optic Sensors	77
2.1.4	Switching Hysteresis	6	9.1	Fundamentals	77
2.1.5	Switching Frequency	6	9.1.1	Structure and Function	77
2.1.6	Speed	6	9.2	Experiments	79
2.1.7	Response Curve	6	Solutions Section	S 1	
2.2	Experiments	7	2	Inductive Sensors	S 1
3	Capacitive Sensors	19	3	Capacitive Sensors	S 5
3.1	Fundamentals	19	4	Magnetic Field Sensors	S 9
3.1.1	Structure and Function	19	5	Optical Sensors	S 11
3.1.2	Reduction Factor	20	6	Inductive Analog Sensors	S 13
3.1.3	Sensitivity	21	7	Ultrasonic Sensors	S 15
3.1.4	Permittivity Factor	21	8	NAMUR Sensors	S 19
3.2	Experiments	22	9	Fibre Optic Sensors	S 25
4	Magnetic Field Sensors	31	Appendix	A 1	
4.1	Fundamentals	31	Symbols and Units	A 1	
4.1.1	Hall Sensors	32	Measuring Equipments Required	A 2	
4.1.2	Magnetoresistive Sensors	32	Data Sheets	D 1 ... D 12	
4.1.3	Saturation Core Probes	33	Foils	F 1 ... F 14	
4.2	Experiments	34			
5	Optical Sensors	41			
5.1	Fundamentals	41			
5.1.1	Structure and Function	41			
5.1.2	Scanning Width	42			