

# THE DISTRIBUTED FIBRE OPTIC SENSING HANDBOOK

John P Dakin  
Editor

**Physikalische Bibliothek**  
Fachbereich 5  
Technische Hochschule Darmstadt  
Hochschulstraße 2  
**D-6100 Darmstadt**

I/3938

IFS Publications, UK  
Springer-Verlag  
Berlin – Heidelberg · New York · Tokyo  
1990

# Contents

**Preface:** J. P. Dakin

<b>Distributed sensor systems fundamentals</b>	1
<b>Multiplexed and distributed optical fibre sensor systems</b> J. P. Dakin, York Ltd, UK	3
<b>Review of modulating techniques for fibre-optic sensors</b> R. S. Medlock ABB Kent plc, UK	21
<b>Point and distributed polarimetric optical-fibre sensors</b> A. J. Rogers, King's College London, UK	35
<b>Advances in distributed fibre-optic detection and ranging</b> S. A. Kingsley, Fiberdyne Optoelectronics, USA	45
<b>Distributed sensor systems design</b>	57
<b>Distributed optical-fibre sensors for the measurement of pressure, strain and temperature</b> A. J. Rogers, King's College London, UK	59
<b>A coherent time multiplexed distributed sensing system</b> N. E. Jolley and R. E. Epworth, STC Technology Ltd, UK and S. Wright, Hewlett Packard Laboratories, UK	73
<b>A novel distributed fibre sensing system enabling location of disturbances in a Sagnac Loop Interferometer</b> J. P. Dakin, York Ltd, UK; D. A. J. Pearce, Madge Networks, UK, and A. P. Strong and C. A. Wade, Plessey Research, UK	77
<b>Distributed sensors based on differential absorption</b> E. Theocharous, BP Research, UK	81
<b>Correlation optical time domain reflectometry for high resolution distributed fibre-optic sensing</b> J. J. Bernard and E. Depresles, CGE Research Centre, France	85
<b>Distributed optical fibre temperature sensor using spread-spectrum techniques</b> J. K. A. Everard and R. Thomas, King's College London, UK	91
<b>Progress in OTDR optical fibre sensor networks</b> F. X. Desforges, P. Graindorge, L. B. Jeunhomme and H. J. Arditty, Photonetics SA, France	95
<b>Birefringent stress location sensor</b> R. B. Franks, University of Sheffield, UK; W. Torruellas, France; R. C. Youngquist, Stanford University, USA	103
<b>Distributed fibre-optic sensor using forward travelling light in polarisation maintaining fibre</b> K. Kurosawa and S. Hattori, Tokyo Electric Power Co, Japan, and T. Yoshino, Gunma University, Japan	109
<b>Special shaped fibres for distributed sensors</b> A. C. Boucouvalas, Hewlett Packard Laboratories, UK, and N. S. Rayit and M. Greaves, GEC Research Ltd, UK	113

<b>Temperature sensing</b>	117
<b>Temperature measurement using intrinsic optical fibre sensors</b>	119
J. P. Dakin, York Ltd, UK	
<b>Distributed temperature sensor based on liquid-core optical fibres</b>	129
A. H. Hartog, York Ltd, UK	
<b>Distributed optical fibre Raman temperature sensor using a semiconductor light source and detector</b>	143
J. P. Dakin, York Ltd, UK; D. J. Pratt, Plessey Ltd, UK; G. W. Bibby, Central Electricity Generating Board, UK, and J. N. Ross, University of Southampton, UK	
<b>Distributed fibre-optic hot-spot sensors</b>	147
S. A. Kingsley, Fiberdyne Optoelectronics, USA, and V. D. McGinniss, Battelle Columbus Division, USA	
<b>New fibre-optic distributed temperature sensor</b>	153
P. Lecoy, M. Groos and L. Guenadez, École Centrale de Paris, France	
<b>Temperature sensing by thermally-induced absorption in neodymium doped optical fibre</b>	159
M. C. Farries, Plessey Research, UK, and M. E. Fermann, University of Southampton, UK	
<b>A distributed fibre temperature sensor using the optical Kerr effect</b>	163
J. P. Dakin, York Ltd; D. J. Pratt, C. Edge, M. J. Goodwin and I. Bennion, Plessey Research, UK	
<b>Pressure/Chemical Sensing</b>	169
<b>Intrinsic fibre-optic sensors</b>	171
G. Oscroft, Herga Electric Ltd, UK	
<b>Distributed strain sensing with a twin-core fibre-optic sensor</b>	179
J. R. Dunphy, G. Meltz and R. M. Elkow, United Technologies Research Centre, USA	
<b>Fibre-optic sensor for measuring external forces distributed along a fibre</b>	183
M. Tsubokawa and T. Higashi, NTT Transmission Systems Laboratories, Japan, and S. Seikai, Ritsumeikan University, Japan	
<b>Distributed fibre-optic interferometric sensor for the detection of pressure fluctuations in reservoirs</b>	187
M. Martinelli, O. de Sanstsis and P. G. Sona, CISE SpA, Italy	
<b>A distributed fibre-optic sensor based on cladding fluorescence</b>	193
R. A. Lieberman, L. L. Blyler and L. G. Cohen, AT&T Bell Laboratories, USA	
<b>A plastic clad silica fibre chemical sensor for ammonia</b>	203
L. L. Blyler and J. B. MacChesney, AT&T Bell Laboratories, USA, and J. A. Ferrara, University of Washington, USA	
<b>Authors' organisations and addresses</b>	205
<b>Source of material</b>	209