

The Market for Temperature Sensors in the Americas, 2nd Edition

Flow Research, Inc.
Wakefield, Massachusetts

May 2006

The Market for Temperature Sensors in the Americas, 2nd Edition

Researched by:

Flow Research, Inc.
27 Water Street – Suite B7
Wakefield, MA 01880

781-245-3200
800-245-1799 (from the USA)
781-224-7552 (fax)
info@flowresearch.com
www.flowresearch.com

Project Team
Jesse Yoder, PhD. - Project Director
Norman Weeks
Belinda Burum

Published by



May 2006

Copyright © 2006

Flow Research, Inc.

All data and information in this study is proprietary and copyrighted by Flow Research, Inc. No part of this study may be reproduced orally or in written form to anyone outside the internal organization of the client for five years from the date of this study without the prior written consent of Flow Research, Inc.

Disclaimer

While every effort has been made to insure that this study is accurate and complete, Flow Research, Inc. accepts no liability for consequences of any actions that are based on the findings in this study.

Table of Contents

Chapter One	Executive Summary
Overview	1-1
Study Objectives	1-1
Methodology	1-2
Overview	1-2
Growth Factors for the Temperature Sensor Market	1-3
Market Shares for Temperature Sensors in the Americas	1-4
Strategies for Success	1-4
Guidelines for Applying the Strategies.....	1-5
Chapter Two	Scope and Methodology
Overview	2-1
Study Objectives	2-1
Methodology	2-2
Geographic Regions.....	2-5
End User Industries.....	2-9
Team History and Experience.....	2-9
Flow Research, Inc.....	2-10
Flow Research Studies.....	2-11
Flow Research Instrumentation Articles.....	2-12
Custom Projects	2-15

Table of Contents

(continued)

Chapter Three Product Definition and Technology Analysis

Overview	3-1
Background of Industrial Temperature Measurement	3-1
A Historical Perspective on Temperature Measurement	3-2
Temperature Scales.....	3-3
Methods of Industrial Temperature Measurement.....	3-5
Other Temperature Measurement Technologies.....	3-7
Technology of Industrial Temperature Sensors.....	3-8
Measuring Junction.....	3-9
Measuring the Reference Junction.....	3-10
Thermocouple Types	3-11
Classification of Thermocouples by Type	3-13
RTD Technology	3-13
Classification of RTDs by Type	3-13
Thermistor Technology.....	3-14
Infrared Technology.....	3-14
Infrared Thermocouples.....	3-15
Infrared Thermometers	3-16
Infrared Linescanners.....	3-17
Classification of Infrared Temperature Sensors	3-17
Fiber Optic Temperature Sensors	3-17
Relative Advantages of Different Temperature Sensors	3-18
Temperature Sensor Product Analysis.....	3-20

Product Analysis for 12 Manufacturers is found on Pages 3-20 through 3-46

ABB	3-21
BetaTHERM	3-22
Burns Engineering	3-26
Emerson Process Management - Rosemount.....	3-28
Mac-Weld	3-30
Minco	3-31
Omega	3-34
Pyromation.....	3-36
Raytek	3-39
Thermo Electric	3-41

Table of Contents

(continued)

Watlow	3-43
YSI Temperature.....	3-45
Temperature Sensor Supplies: Figure 3-3.....	3-47-3-52

Chapter Four Market Size and Growth Forecast

Overview	4-1
Technology Shifts Characterize the Temperature Sensors Market.....	4-3
Growth Factors for the Temperature Sensors Market.....	4-4
Economic Growth in the United States and Other Countries	4-5
Demand for Higher Standard of Living in Many Countries	4-5
Increased Capital Spending.....	4-6
Plant Renovations and Upgrades	4-6
The Need to Maintain the Installed Base of Thermocouples and RTDs	4-6
Safety Issues Becoming Increasingly Important.....	4-7
Greater Emphasis on Environmental Regulations	4-8
The Need to Conserve Energy	4-8
The Shift from Thermocouples to RTDs is Continuing.....	4-9
A Changeover from Wirewound to Thin-Film RTDs.....	4-10
A Stable Growth Rate for the Temperature Sensors Market	4-10
Increased Availability of Fieldbus Products	4-10
Technology Improvements in Temperature Sensors	4-10
Factors Limiting the Growth of Temperature Sensors	4-11
The Inherently Conservative Nature of Users in the Process Industries	4-12
Competitive Pricing on Temperature Sensors	4-12
Import Restrictions and Export Requirements.....	4-13
Market Size and Growth Forecasts	4-13
Total Shipments of Temperature Sensors by Geographic Region: Figures 4-1 to 4-5	4-14
Total Shipments of Temperature Sensors by Sensor Type: Figures 4-4 to 4-8	4-15
Shipments of Temperature Sensors in the United States by Sensor Type:	
Figures 4-9 to 4-13	4-17
Shipments of Temperature Sensors in Canada by Sensor Type:	
Figures 4-14 to 4-18	4-19
Shipments of Temperature Sensors in Latin America by Sensor Type:	
Figures 4-19 to 4-23	4-21
Average Selling Price of Temperature Sensors: Figures 4-24 to 4-27	4-22

Table of Contents

(continued)

Shipments of Thermocouples by Geographic Region: Figures 4-28 to 4-32	4-24
Shipments of RTDs by Geographic Region: Figures 4-33 to 4-37.....	4-25
Shipments of Thermistors by Geographic Region: Figures 4-38 to 4-42	4-26
Shipments of Infrared Thermometers by Geographic Region: Figures 4-43 to 4-47.....	4-27
Shipment of Fiber Optic Temperature Sensors by Geographic Region: Figures 4-48 to 4-52.....	4-29
Shipments of Thermowells by Geographic Region: Figures 4-53 to 4-57	4-29
Shipments of Thermocouples by Type: Figures 4-58 to 4-60	4-31
Shipments of RTDs by Type: Figures 4-61 to 4-63.....	4-32
Shipments of Infrared Thermometers by Type: Figures 4-64 to 4-66.....	4-33
Shipments of Temperature Sensors by Industry: Figures 4-67to 4-70	4-34
Shipments of Temperature Sensors by Customer Type: Figures 4-71to 4-73.....	4-36
Shipments of Temperature Sensors in the Americas by Distribution Channel: Figures 4-74 to 4-76.....	4-36
Temperature Sensors Growth and Forecast Figures	4-39 to 4-111

Chapter Five

Market Shares of the Leading Suppliers

Overview	5-1
Changes in Temperature Sensor Suppliers Since 2000	5-1
Market Shares for Temperature Sensors in the Americas	5-2
Temperature Sensor Market Share Charts	5-9 to 5-34

Chapter Six

Strategies for Success

Overview	6-1
Guidelines for Applying Strategies.....	6-1
Offer a Broad Range of Temperature Sensor Types Relative to your Target Markets ..	6-2
Offer Range of Products to Meet Different Customer Needs.....	6-3
Offer a Full Line of Accessories.....	6-4
Resell What you Cannot Manufacture.....	6-4
Provide Detailed Information on Sensor Products on the Internet	6-5
Expand into Other Industries	6-5
Take Advantage of the Regional Nature of the Temperature Business.....	6-6

Table of Contents

(continued)

Invest in Programmable, Smart, and Fieldbus Products	6-6
Become a One-Stop Shop	6-7
Seek Out New Ways to Measure Temperature.....	6-7

Chapter Seven Supplier Profiles

ABB	7-3
Abbeon Cal	7-8
Acrolab	7-9
Alloy Engineering.....	7-11
ARI Industries.....	7-13
Athena Controls	7-15
BetaTHERM Corporation.....	7-16
Burns Engineering	7-20
Chromalox Instruments and Controls	7-23
Cleveland Electric Laboratories.....	7-25
Conax Buffalo.....	7-27
Consistec Controle e Sistemas de Automacao Ltd.	7-29
Convectronics	7-30
Cooper-Atkins.....	7-31
Cornerstone Sensors.....	7-33
CSI International Inc.....	7-34
C-Temp	7-35
Daily Thermetrics Corporation	7-37
Ecil Produtos e Sistemas de Medição e Controle Ltda	7-39
Electronic Development Laboratories	7-41
Emerson	7-43
Emerson Process Management - Rosemount.....	7-44
Enercorp Instruments Ltd.	7-49
Engelhard Corp.	7-51
Eurotherm Barber-Colman.....	7-53
Eustis Pyrocom Company.....	7-55
Exergen Corporation.....	7-57
FISO Technologies	7-59
Furnace Parts.....	7-61
Gayesco	7-63
GE Sensing (formerly Thermometrics)	7-65

Table of Contents

(continued)

Harco Laboratories.....	7-66
Heraeus Holding GmbH	7-69
Honeywell Sensing and Controls.....	7-74
Idaho Laboratories	7-77
IOPE Precision Instruments.....	7-78
IPITEK, Inc.	7-80
Ircor, Inc.	7-81
JMS Southeast Inc.....	7-84
JUMO Process Control	7-85
Koenig-Pretempco	7-87
KRL/Bantry Components	7-88
Land Instruments International.....	7-90
Linear Laboratories.....	7-93
Luxtron Corporation	7-95
Mac-Weld Machining	7-97
Marlin Manufacturing.....	7-99
Mikron Infrared.....	7-101
Minco Products, Inc.	7-103
Omega Engineering, Inc.	7-106
Pyromation, Inc.	7-110
Raytek Corporation.....	7-113
RdF Corporation	7-116
RTD Company	7-118
Sandelius Instruments, Inc.	7-119
Sensor Scientific, Inc.	7-121
Sensotec	7-122
Smart Sensors.....	7-123
Texas Thermowell Industries.....	7-125
ThermoCoax SAS	7-126
Thermo Electric	7-128
Thermo-Kinetics Company	7-131
Thermoteknix Systems Ltd.....	7-133
United Electric Controls	7-135
U.S. Sensor.....	7-136
Vulcan Electric Company	7-137
Watlow	7-138
Weed Instrument	7-140

Table of Contents

(continued)

Wika Instruments (Alltemp Sensors).....	7-143
Williamson Corporation.....	7-145
YSI, Inc	7-147

Appendix A: A Study Proposal

Study Proposal	A-1
A Proposal for a Market Study of Temperature Sensors in the Americas.....	A-2
Rationale for Study	A-2
Scope of Study	A-3
Temperature Sensors by Region	A-4
Market Shares for Temperature Sensors in the Americas	A-6
RTDs in the Americas.....	A-7
Market Shares for RTDs in the Chemical Industry in the Americas	A-7
Key Issues in this Study.....	A-9
End-User Survey.....	A-10
Timing of the Study	A-10
Background.....	A-10
E-Z Faxback Response Form.....	A-12

Appendix B: Director of Temperature Sensor Suppliers

Directory of Temperature Suppliers	B-2 through B-28
--	------------------

Flow Research Services

Worldflow Monitoring Service

List of Figures

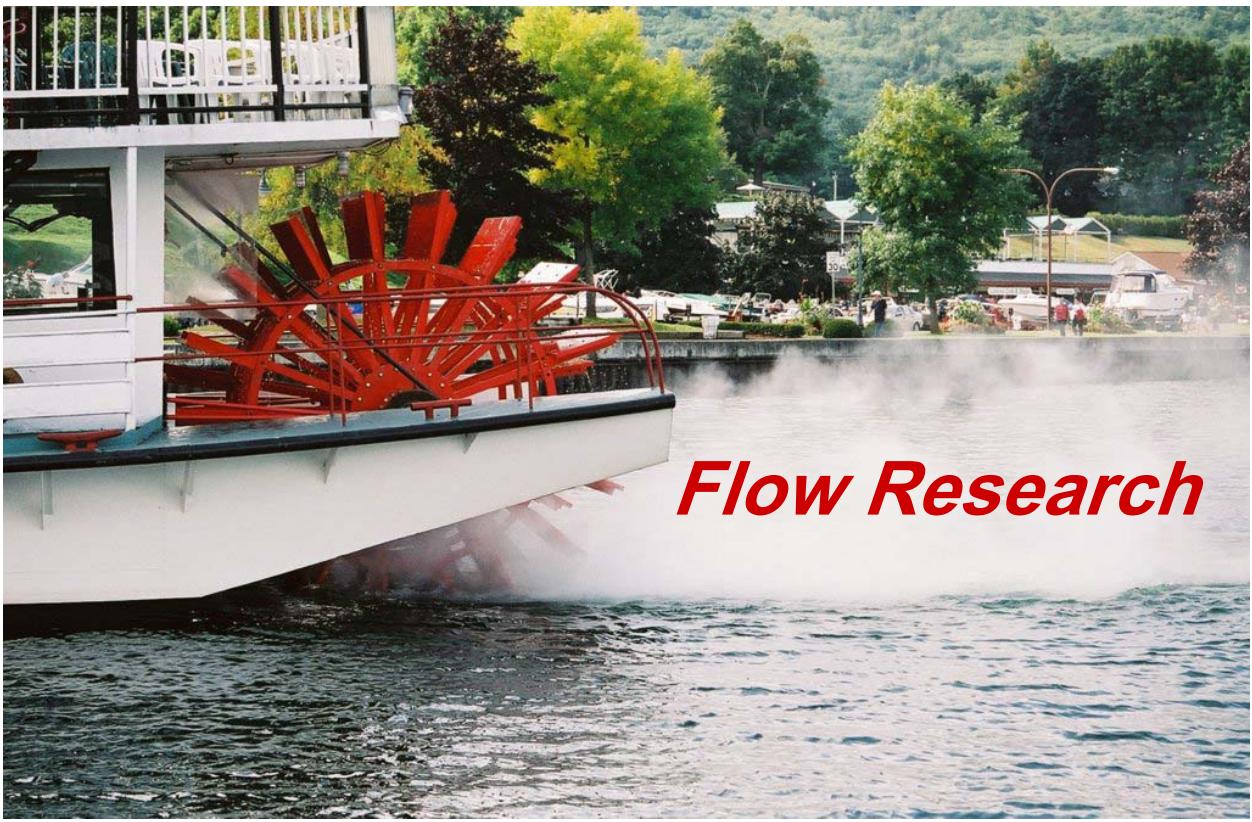
Figure Number

1-1	Total Shipments of Temperature Sensors in the Americas.....	1-15
1-2	Total Shipments of Temperature Sensors in the Americas.....	1-16
1-3	Total Shipments of Temperature Sensors by Geographic Region.....	1-17
1-4	Shipments of Temperature Sensors in the Americas by Sensor Type	1-18
1-5	Shipments of Temperature Sensors in the Americas by Sensor Type	1-19
1-6	Market Shares for the Leading Suppliers of Temperature Sensors in the Americas.....	1-20
3-1	Thermocouple Types	3-12
3-2	Relative Advantages of Different Sensors.....	3-16
3-3	Temperature Sensor Suppliers	3-47
4-1	Total Shipments of Temperature Sensors in the Americas.....	4-39
4-2	Total Shipments of Temperature Sensors in the Americas.....	4-40
4-3	Total Shipments of Temperature Sensors by Geographic Region.....	4-41
4-4	Total Shipments of Temperature Sensors by Geographic Region.....	4-42
4-5	Shipments of Temperature Sensors by Geographic Region	4-43
4-6	Shipments of Temperature Sensors in the Americas by Sensor Type	4-44
4-7	Shipments of Temperature Sensors in the Americas by Sensor Type	4-45
4-8	Shipments of Temperature Sensors in the Americas by Sensor Type	4-46
4-9	Shipments of Temperature Sensors in the United States	4-47
4-10	Shipments of Temperature Sensors in the United States	4-48
4-11	Shipments of Temperature Sensors in the United States by Sensor Type	4-49
4-12	Shipments of Temperature Sensors in the United States by Sensor Type	4-50
4-13	Shipments of Temperature Sensors in the United States by Sensor Type	4-51
4-14	Shipments of Temperature Sensors in Canada	4-52
4-15	Shipments of Temperature Sensors in Canada	4-53
4-16	Shipments of Temperature Sensors in Canada by Sensor Type	4-54
4-17	Shipments of Temperature Sensors in Canada by Sensor Type	4-55
4-18	Shipments of Temperature Sensors in Canada by Sensor Type	4-56
4-19	Shipments of Temperature Sensors in Latin America	4-57
4-20	Shipments of Temperature Sensors in Latin America	4-58
4-21	Shipments of Temperature Sensors in Latin America by Sensor Type	4-59
4-22	Shipments of Temperature Sensors in Latin America by Sensor Type	4-60

4-23	Shipments of Temperature Sensors in Latin America by Sensor Type	4-61
4-24	Average Selling Price of Temperature Sensors by Sensor Type in the Americas.....	4-62
4-25	Average Selling Price of Temperature Sensors by Sensor Type in The United States.....	4-62
4-26	Average Selling Price of Temperature Sensors by Sensor Type in Canada ..	4-63
4-27	Average Selling Price of Temperature Sensors by Sensor Type in Latin America	4-63
4-28	Total Shipments of Thermocouples in the Americas.....	4-64
4-29	Total Shipments of Thermocouples in the Americas.....	4-65
4-30	Total Shipments of Thermocouples by Geographic Region.....	4-66
4-31	Total Shipments of Thermocouples by Geographic Region.....	4-67
4-32	Shipments of Thermocouples by Geographic Region	4-68
4-33	Total Shipments of RTDs in the Americas	4-69
4-34	Total Shipments of RTDs in the Americas	4-70
4-35	Total Shipments of RTDs by Geographic Region	4-71
4-36	Total Shipments of RTDs by Geographic Region	4-72
4-37	Shipments of RTDs by Geographic Region.....	4-73
4-38	Total Shipments of Thermistors in the Americas	4-74
4-39	Total Shipments of Thermistors in the Americas	4-75
4-40	Total Shipments of Thermistors by Geographic Region	4-76
4-41	Total Shipments of Thermistors by Geographic Region	4-77
4-42	Shipments of Thermistors by Geographic Region.....	4-78
4-43	Total Shipments of Infrared Thermometers in the Americas	4-79
4-44	Total Shipments of Infrared Thermometers in the Americas	4-80
4-45	Total Shipments of Infrared Thermometers by Geographic Region	4-81
4-46	Total Shipments of Infrared Thermometers by Geographic Region	4-82
4-47	Shipments of Infrared Thermometers by Geographic Region.....	4-83
4-48	Total Shipments of Fiber Optic Temperature Sensors by Geographic Region	4-84
4-49	Total Shipments of Fiber Optic Temperature Sensors in the Americas	4-85
4-50	Total Shipments of Fiber Optic Temperature Sensors in the Americas	4-86
4-51	Total Shipments of Fiber Optic Temperature Sensors by Geographic Region	4-87
4-52	Shipments of Fiber Optic Temperature Sensors by Geographic Region	4-88
4-53	Total Shipments of Thermowells in the Americas	4-89
4-54	Total Shipments of Thermowells in the Americas	4-90
4-55	Total Shipments of Thermowells by Geographic Region.....	4-91
4-56	Total Shipments of Thermowells by Geographic Region.....	4-92

4-57	Shipments of Thermowells by Geographic Region	4-93
4-58	Shipments of Thermocouples by Type in the Americas	4-94
4-59	Shipments of Thermocouples by Type in the Americas	4-95
4-60	Shipments of Thermocouples by Type in the Americas	4-96
4-61	Shipments of RTDs by Type in the Americas	4-97
4-62	Shipments of RTDs by Type in the Americas	4-98
4-63	Shipments of RTDs by Type in the Americas	4-99
4-64	Shipments of Infrared Thermometers by Type in the Americas.....	4-100
4-65	Shipments of Infrared Thermometers by Type in the Americas.....	4-101
4-66	Shipments of Infrared Thermometers by Type in the Americas.....	4-102
4-67	Shipments of Temperature Sensors in the Americas by Industry	4-103
4-68	Shipments of Temperature Sensors in the United States by Industry.....	4-104
4-69	Shipments of Temperature Sensors in Canada by Industry	4-105
4-70	Shipments of Temperature Sensors in Latin America by Industry	4-106
4-71	Shipments of Temperature Sensors in Americas by Customer Type	4-107
4-72	Shipments of Temperature Sensors by Customer Type by Region	4-108
4-73	Shipments of Temperature Sensors by Customer Type by Region	4-109
4-74	Shipments of Temperature Sensors in the Americas by Distribution Channel	4-110
4-75	Shipments of Temperature Sensors by Distribution Channel by Region	4-111
4-76	Shipments of Temperature Sensors by Distribution Channel by Region	4-112
5-1	Market Shares for the Leading Suppliers of Temperature Sensors in the Americas	5-9
5-2	Market Shares for the Leading Suppliers of Temperature Sensors in United States	5-10
5-3	Market Shares for the Leading Suppliers of Temperature Sensors in Canada	5-11
5-4	Market Shares for the Leading Suppliers of Temperature Sensors in Latin America	5-12
5-5	Market Shares for Leading Suppliers of Thermocouples in the Americas....	5-13
5-6	Market Shares for Leading Suppliers of Thermocouples in the United States	5-14
5-7	Market Shares for Leading Suppliers of Thermocouples in Canada	5-15
5-8	Market Shares for Leading Suppliers of Thermocouples in Latin America	5-16
5-9	Market Shares for Leading Suppliers of RTDs in the Americas	5-17
5-10	Market Shares for Leading Suppliers of RTDs in the United States	5-18
5-11	Market Shares for Leading Suppliers of RTDs in Canada	5-19
5-12	Market Shares for Leading Suppliers of RTDs in Latin America	5-20

5-13	Market Shares for Leading Suppliers of Thermistors in the Americas	5-21
5-14	Market Shares for Leading Suppliers of Thermistors in the United States	5-22
5-15	Market Shares for Leading Suppliers of Thermistors in Canada.....	5-23
5-16	Market Shares for Leading Suppliers of Thermistors in Latin America	5-24
5-17	Market Shares for Leading Suppliers of Infrared Thermometers in the Americas	5-25
5-18	Market Shares for Leading Suppliers of Infrared Thermometers in the United States	5-26
5-19	Market Shares for Leading Suppliers of Infrared Thermometers in Canada	5-27
5-20	Market Shares for Leading Suppliers of Infrared Thermometers in Latin America	5-28
5-21	Market Shares for Leading Suppliers of Fiber Optic Temperature Sensors in the Americas	5-29
5-22	Market Shares for Leading Suppliers of Fiber Optic Temperature Sensors in the United States	5-30
5-23	Market Shares for Leading Suppliers of Thermowell in the Americas	5-31
5-24	Market Shares for Leading Suppliers of Thermowell in the United States	5-32
5-25	Market Shares for Leading Suppliers of Thermowell in Canada	5-33
5-26	Market Shares for Leading Suppliers of Thermowell in Latin America	5-34
6-1	Offer a Broad Range of Temperature Sensors.....	6-9



Flow Research