Rosemount 244ER PC-Programmable Temperature Transmitter

- *Accepts a wide variety of 2-, 3-, and 4-wire RTDs and thermocouple sensor types*
- *Configure using the Rosemount 244EC Configuration Interface and a standard PC*
- *Provides 500 VAC input to output isolation*
- *Available in a rail mount package that is designed for the close corridors of a control room*
- *External hardware switch provides reliable alarm*

CE

Content

Product Data Sheet
00813-0100-4737, Rev GA
Catalog 2005

The Rosemount 244ER PC-Programmable Temperature Transmitter

The Rosemount 244ER is a cost-efficient solution for non-critical temperature monitoring applications. Compared to wiring direct, the 244ER will save money in cabling and installation costs while delivering accurate and reliable measurement.

FLEXIBILITY

The 244ER allows for great flexibility in selecting a sensor type that is appropriate for the process being measured. The 244ER accepts inputs from a wide variety of 2-, 3-, and 4-wire RTDs as well as thermocouples, millivolt, and ohm sensor types.

ISOLATION

The 244ER is designed with 500 VAC input to output isolation. This isolation helps to ensure the integrity of the temperature measurement in industrial environments and not damage sensitive system electronics.

PROGRAMMABLE

The Rosemount 244EC Configuration Interface consists of a programmer, cables, and configuration software. The 244EC configuration software, when used in conjunction with the interface, provides the tools necessary to select the sensor type, sensor range, and sensor error action in addition to many other options.

Rosemount Temperature Solutions

Rosemount 3144P Temperature Transmitter
Field mount style available with HART® protocol.

Rosemount 3244MV Temperature Transmitter
Field mount style available with FOUNDATION fieldbus™ and Profibus-PA protocols.

Rosemount 644 Smart Temperature Transmitter
Head or rail mount styles available with HART and FOUNDATION fieldbus protocol.

Rosemount 848T Eight Input Temperature Transmitter
Eight input transmitter available with FOUNDATION fieldbus protocol.

Rosemount 3420 Fieldbus Interface Module
Provides an interface between FOUNDATION fieldbus instruments and systems without fieldbus capability using standard interface protocols.

Rosemount 248 Temperature Transmitter
Head mount style (DIN B) available with HART protocol and complete temperature assembly.

Rosemount sensors, thermowells, and extensions
Rosemount has a broad offering of RTD and thermocouples that are designed to meet plant requirements.

Specifications

FUNCTIONAL SPECIFICATIONS

Inputs
User-selectable using the 244EC Configuration Interface and the 244EC Configuration Software. Sensor terminals are rated to 42.4 V dc. See “Accuracy” on page Temperature-94.

Output
2-wire 4–20 mA, linear with temperature for RTDs and thermocouples and linear with input for millivolts and ohms.

Isolation
Input/output isolation tested to 500 V ac rms (707 V dc) at 50/60 Hz

Power Supply
An external power supply is required. The transmitter operates on 12.0 to 42.4 V dc. Transmitter power terminals are rated to 42.4 V dc.

Failure Mode
The 244ER features software driven alarm diagnostics and an independent circuit. These features are designed to provide backup alarm outputs in case the microprocessor, electronics, hardware, or software fails. The alarm levels are user-selectable using the failure mode switch. In case of alarm, the position of the jumper determines the direction in which the output is driven (HI or LO). The jumper switch feeds into the digital-to-analog (D/A) converter, which drives the proper alarm output even if the microprocessor fails. The values that the transmitter drives its output in failure mode depends on whether it is factory configured to standard or NAMUR compliant operation. The values for standard and NAMUR-compliant operation are as follows.

TABLE 1. Standard vs. NAMUR-compliant specifications

	Standard (1)	NAMUR- Compliant(1)
Linear Output:	$3.9 \leq I \leq 20.5$	$3.8 \leq I \leq 20.5$
Fail High:	$21 \leq I \leq 23$ (default)	$21 \leq I \leq 23$ (default)
Fail Low:	$I \leq 3.75$	$I \leq 3.6$

(1) Measured in milliamperes

Humidity Limits
0–99% relative humidity, non-condensing

Update Time
Approximately 0.5 seconds

Temperature Limits
Operating Limit
- –40 to 85 °C (–40 to 185 °F)

Storage Limit
- –50 to 120 °C (–58 to 248 °F)

Turn-on Time
Performance within specifications is less than 5.0 seconds after power is applied to transmitter when damping value is set to zero seconds

PHYSICAL SPECIFICATIONS

Electrical Connections
Power and Sensor Terminals
- Compression screw permanently fixed to front panel

Communication Terminals
- Clips permanently fixed to front panel

Materials of Construction
Electronics Housing an Terminal Block Construction Materials
- *Lexan*® polycarbonate

Mounting
The 244ER attaches directly to a wall or a DIN rail.

Weight
173 g (6.10 oz.)

PERFORMANCE SPECIFICATIONS

Stability
RTDs and thermocouples have a stability of ±0.1% of reading or 0.1 °C (whichever is greater) for twelve months.

Power Supply Effect
Less than ±0.005% of span per volt

Vibration Effect
The 244ER is tested to the following specifications with no effect on performance:

Frequency	Vibration
10 to 60 Hz	0.21 displacement
60 to 2000 Hz	3 g peak acceleration

CE Electromagnetic Compatibility Compliance Testing
The 244ER meets all requirements listed under IEC 61326: Amendment 1, 1998.

Accuracy

TABLE 2. Accuracy/Input Options

Sensor Options	Sensor Reference	Input Ranges		Recommended Min. Span[1]		Accuracy (whichever is greater)
2-, 3-, 4-wire RTDs		°C	°F	°C	°F	
Pt 100	IEC 751, 1995 (α = 0.00385)	–200 to 850	–328 to 1562	10	18	0.05% of span + 0.15 °C or 0.2 °C
Pt 100	JIS 1604, 1981 (α = 0.003916)	–200 to 645	–328 to 1093	10	18	0.05% of span + 0.15 °C or 0.2 °C
Pt 200	IEC 751, 1995 (α = 0.00385)	–200 to 850	–328 to 1562	10	18	0.01% of span or 0.4 °C
Pt 500	IEC 751, 1995 (α = 0.00385)	–200 to 850	–328 to 1562	10	18	0.01% of span or 0.3 °C
Pt 1000	IEC 751, 1995 (α = 0.00385)	–200 to 300	–328 to 572	10	18	0.01% of span or 0.3 °C
Ni 120	Edison Curve No. 7	–70 to 300	–94 to 572	10	18	0.01% of span or 0.2 °C
Cu 10	Edison Copper Winding No. 1	–50 to 250	–58 to 482	10	18	0.5% of span or 1.5 °C
Thermocouples[2]						
Type B[3]	NIST Monograph 175, IEC 584	100 to 1820	212 to 3308	25	40	0.2% of span or 1.0 °C
Type E	NIST Monograph 175, IEC 584	–50 to 1000	–58 to 1832	25	40	0.1% of span or 0.5 °C
Type J	NIST Monograph 175, IEC 584	–180 to 760	–292 to 1400	25	40	0.1% of span or 0.5 °C
Type K	NIST Monograph 175, IEC 584	–180 to 1372	–292 to 2502	25	40	0.1% of span or 1.0 °C
Type N	NIST Monograph 175, IEC 584	–200 to 1300	–328 to 2372	25	40	0.1% of span or 1.0 °C
Type R	NIST Monograph 175, IEC 584	0 to 1768	32 to 3214	25	40	0.1% of span or 1.0 °C
Type S	NIST Monograph 175, IEC 584	0 to 1768	32 to 3214	25	40	0.1% of span or 1.0°C
Type T	NIST Monograph 175, IEC 584	–200 to 400	–328 to 752	25	40	0.1% of span or 0.5 °C
DIN Type L	DIN 43710	–200 to 900	–328 to 1652	25	40	0.1% of span or 0.5 °C
DIN Type U	DIN 43710	–200 to 600	–328 to 1112	25	40	0.1% of span or 0.5 °C
Type W5Re/W26Re	ASTME 988-96	0 to 2000	32 to 3632	25	40	0.1% of span or 1.0 °C
Millivolt Input		–10 to 100 mV		3 mV		0.025 mV + 0.003% of span
2-, 3-, 4-wire Ohm Input		0 to 2000 ohms		20 ohm		0.75 Ω + 0.03% of span

(1) No minimum or maximum span restrictions within the input ranges. Recommended minimum span will hold noise within accuracy specification with damping at zero seconds.

(2) Total digital accuracy for thermocouple measurement: sum of digital accuracy +0.5 °C (cold junction accuracy).

(3) Accuracy for NIST Type B thermocouple is ±3.0 °C from 100 to 300 °C.

Accuracy Example

When using a Pt 100 (α = 0.00385) sensor input with a 75 to 150 °C range, the accuracy will be ±0.15 °C of span + 0.15 °C or 0.2 °C, whichever is greater. Sample Calculation: [0.0005 (150-75)+0.15] = 0.19 °C, whichever is less than 0.2 °C, so the accuracy equals 0.2.

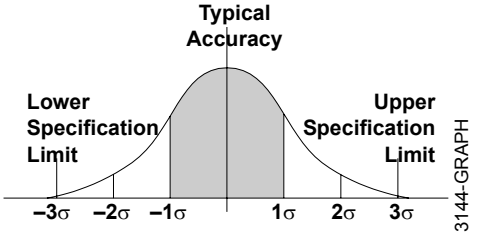
.

Rosemount Conformance to Specifications

You can be confident that a Rosemount product not only meets its published specifications, but most likely exceeds them. Our advanced manufacturing techniques and use of Statistical Process Control provide specification conformance to at least ±3σ[1]. In addition, our commitment to continual improvement ensures that product design, reliability, and performance will improve every year.

For example, the Reference Accuracy distribution for the 244ER Temperature Transmitter is shown to the right. Our Specification Limits are ± 0.2 °C, but, as the shaded area shows, approximately 68% of the units perform three times better than the limits. Therefore, it is very likely that you will receive a device that performs much better than our published specifications.

Conversely, a vendor who "grades" product without using Process Control, or who is not committed to ± 3σ performance, will ship a much higher percentage of units that are barely within (or even outside of) advertised specification limits.



Note: Accuracy distribution shown is for 244E, Pt 100 RTD sensor, range 0 to 100 °C.

(1) Sigma (σ) is a statistical symbol to designate the standard deviation from the mean value of a normal distribution.

Ambient Temperature Effect

Transmitters can be installed in locations where the ambient temperature is between –40 and 85 °C (–40 and 185 °F). To maintain excellent accuracy performance, each transmitter is individually characterized over this ambient temperature range at the factory. The transmitters automatically adjust for component temperature drift caused by changing environmental conditions.

TABLE 3. Ambient Temperature Effects

Sensor Options[1]	Fixed Value	% of reading		% of Span
		(if reading > 0)	(if reading is < 0)	
2-, 3-, 4-wire RTDs				
Pt 100 (α = 0.00385)	0.003 °C	—	—	0.001% of span
Pt 100 (α = 0.003916)	0.003 °C	—	—	0.001% of span
Pt 200	0.004 °C	—	—	0.001% of span
Pt 500	0.003 °C	—	—	0.001% of span
Pt 1000	0.003 °C	—	—	0.001% of span
Ni 120	0.003 °C	—	—	0.001% of span
Cu 10	0.03 °C	—	—	0.001% of span
Thermocouples				
Type B (100 °C ≤ reading < 300 °C)	0.064 °C	– 0.011	—	0.001% of span
(300 °C ≤ reading < 1000 °C)	0.040 °C	– 0.025	—	0.001% of span
(reading ≥ 1000 °C)	0.014 °C	—	—	0.001% of span
Type E	0.005 °C	– 0.00043	– 0.0043	0.001% of span
Type J, K, DIN L	0.006 °C	– 0.00054	– 0.0025	0.001% of span
Type N	0.007 °C	– 0.00036	—	0.001% of span
Type R, S (reading < 200 °C)	0.023 °C	– 0.0036	—	0.001% of span
(reading ≥ 200 °C)	0.016 °C	—	—	0.001% of span
Type T, DIN U	0.007 °C	—	– 0.043	0.001% of span
Type W5Re/W26Re	0.023 °C	– 0.0036	—	0.001% of span
	0.016°C		—	
Millivolt Input	0.0005 mV	—	—	0.001% of span
2-, 3-, 4-wire Ohm	0.0084 Ω	—	—	0.001% of span

(1) Change in ambient is with reference to the calibration temperature of the transmitter 68 °F (20 °C) from factory.

Temperature Effects Example

Example 1:
When using a Type J thermocouple with a 50 °C to 600 °C temperature range at an ambient temperature of 60 °C and a reading of –25 °C, the ambient temperature effect according to °C is:

- [fixed value (a) + (% of reading (b) x reading) = (% of span (c) x span)] = [0.006 + (–0.000025 x (–25)) + (0.00001 x 650)] = 0.013 °C per °C.

With the ambient temperature 40 °C above reference condition temperature, the total ambient temperature effect is:

- 40 x 0.013 = 0.52 °C

Example 2:
When using a Type J thermocouple with a – 50 °C to 600 °C temperature range at an ambient temperature of 60 °C and a reading of 525 °C, the ambient temperature effect according to °C is:

- [fixed value (a) + (% of reading (b) x reading) = (% of span (c) x span)] = [0.006 + (–0.0000054 x 525) + (0.00001 x 650)] = 0.015 °C per °C.

With the ambient temperature 40 °C above reference condition temperature, the total ambient temperature effect is:

- 40 x 0.015 = 0.6 °C

Example 3:
The worst case error would be:

- Reference Accuracy + CJC Accuracy + Temp Effects = 0.65 °C + 0.5 °C + 0.52 °C = 1.67 °C.

Total probably error: $\sqrt{0.65^2 + 0.5^2 + 0.52^2} = 0.97°C$

Product Certifications

Approved Manufacturing Locations

Rosemount Inc. – Chanhassen, Minnesota, USA
Rosemount Temperature GmbH – Germany
Emerson Process Management Asia Pacific – Singapore

European Union Directive Information

The EC declaration of conformity for all applicable European directives for this product can be found on the Rosemount website at www.rosemount.com. A hard copy may be obtained by contacting our local sales representative.

ATEX Directive (94/9/EC)

Rosemount Inc. complies with the ATEX Directive.

Electro Magnetic Compatibility (EMC) (89/336/EEC)

244ER – EN 50081-1: 1992; EN 50082-2:1995;
EN 61326-1:1997 +AI

Ordinary Location Certification for Factory Mutual

As standard, the transmitter has been examined and tested to determine that the design meets basic electrical, mechanical, and fire protection requirements by FM, a nationally recognized testing laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

Hazardous Locations Certificates

North American Certifications

Factory Mutual (FM) Approvals

I5 Intrinsically Safe for Class I, II, III, Division 1, Groups A, B, C, D, E, F, G; Non-incendive for Class I, Division 2, Groups A, B, C, D hazardous locations when installed in accordance with Rosemount Drawing 00644-0009. Temperature Code T5 (T_{amb} = 80 °C) (T6 (T_{amb} = 40 °C))

Special Conditions for Safe Use (X):
When the output of the associated apparatus does not exceed
P_o = 0.67 Watts, the temperature code is T6 (T_{amb} = 50 °C)

Canadian Standards Association (CSA) Approvals

I6 Intrinsically safe for Class I, Division 1, Groups A, B, C, and D when connected in accordance with Rosemount drawing 00644-1064

European Certifications

I1 ATEX Intrinsic Safety:
Certificate Number: BAS00ATEX1034X
ATEX Marking: ⟨Ex⟩ II 1 G EEx ia IIC T4/T5/T6
CE 1180

TABLE 4. Temperature Code

Pi	Temperature Code
0.67 W	T6 (T_{amb} = – 60 °C to 40 °C)
0.67 W	T5 (T_{amb} = – 60 °C to 50 °C)
1.0 W	T5 (T_{amb} = – 60 °C to 40 °C)
1.0 W	T4 (T_{amb} = – 60 °C to 80 °C)

TABLE 5. Entity Parameters

Loop/Power	Sensor
U_i = 30 V	U_o = 13.6 V
I_i = 200 mA	I_o = 80 mA
P_i = 0.67 W or 1.0 W	P_o = 80 mW
C_i = 10 nF	C_i = 75 nF
L_i = 0	L_i = 0

Special Conditions for Safe Use (X):
The transmitter must be installed so that its external terminals and communication pins are protected to at least IP20. Non-metallic enclosures must have a surface resistance of less than 1GΩ. Light alloy or zirconium enclosures must be protected from impact and friction when installed.

Australian Certifications

Standard Australia Quality Assurance Service (SAA) Approvals

I7 SAA Intrinsic Safety
Certificate Number: AUS Ex03.3877X
Ex ia IIC T5 (T_{amb} = –60 to 75 °C);
T6 (T_{amb} = –60 to 50 °C)

TABLE 6. SAA Entity Parameters

Loop/Power	Sensor
U_i = 30 V	U_o = 17.3 V
I_i = 200 mA	I_o = 247 mA
P_i = 1.0 W	P_o = 0.08 W
C_i = 5.3 nF	C_o = 0.70 µF
L_i = 0 mH	L_i = 3.13 mH

Special Conditions for Safe Use (X):
Installation shall be carried out in accordance with Rosemount Drawings 00644-1044

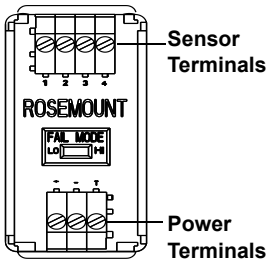
Russian Certifications

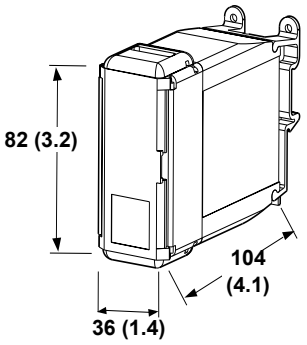
Gostandart

Tested and approved by the Russian Metrological Institute GOSTANDART.

Dimensional Drawings

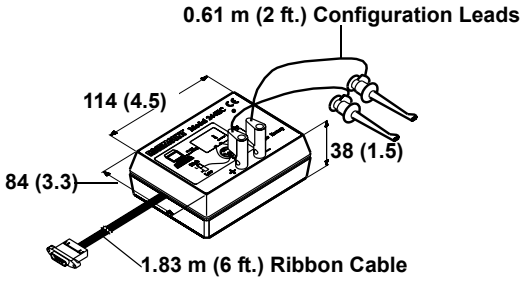
244ER





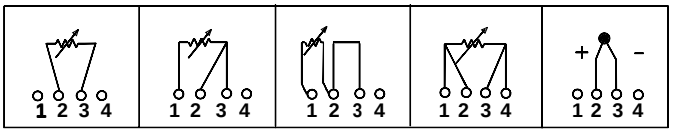
644-1105E01A. 1101A01A

244EC Configuration Interface



644-1105E01A. 1101A01A, 3300A01A

Sensor Connections

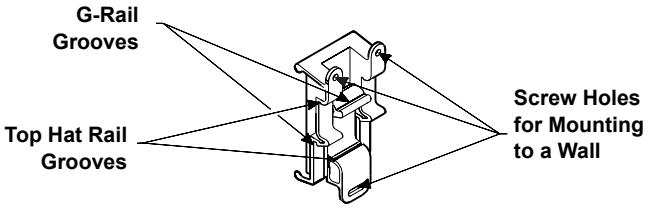


2-wire RTD and Ω	3-wire* RTD and Ω	RTD with** Comp. Loop	4-wire RTD and Ω	T/C and mV

* *Rosemount Inc. provides 4-wire sensors for all single element RTDs. Use these RTDs in 3-wire configurations by leaving the unneeded leads disconnected and insulated with electrical tape.*

** *The transmitters must be configured for a 3-wire RTD in order to recognize an RTD with a compensation loop.*

Mounting
(part number 03044-4301-0001)



644-0000B01A, 3044-4001A01B

Dimensions are in millimeters (inches)

Ordering Information

TABLE 7. Rosemount 244ER Ordering Table

Model	Product Description
244ER	Rail Mount Temperature Transmitter
Code	**Hazardous Area Certifications**
I5(1)	FM intrinsic safety and non-incendive approval
I6(1)	CSA intrinsic safety and non-incendive approval
I1(1)	CENELEC/BASEEFA intrinsic safety approval
I7(1)	SAA intrinsic safety approval
NA(1)	No approval
Code	**Options**
Configuration	
A1	Analog output levels compliant with NAMUR-recommendations NE 43:June 1997
CN	Analog output levels compliant with NAMUR-recommendations NE 43: June 1997: alarm configuration low
F6	60 Hz line voltage filter
Calibration	
C4	5-Point calibration. *Use Q4 option to generate a calibration certificate*
Q4	Calibration certificate. *3-point standard; use C4 with Q4 option for a 5-point calibration certificate.*
Typical Model Number: 244ER I1	

(1) To meet intrinsic safety requirements the transmitter must be installed in an enclosure with IP20 or higher rating.

TABLE 8. Rosemount 244EC Configuration Interface Ordering Information

Model	Product Description
244EC	Rosemount 244EC Configuration Interface Hardware and Software
Typical Model Number: 244EC	

TABLE 9. Transmitter Accessories

Part Description	Part Number
Rosemount 244ER configuration software (Four 3.5” diskettes)	00244-3401-0003
Black *MINIGRABBER*™ configuration lead	C539920001
Red *MINIGRABBER* configuration lead	C539920002
Universal clip for rail or wall mount	03044-4103-0001
24 Inches of symmetric (Top Hat) rail	03044-4200-0001
24 Inches of asymmetric (G) rail	03044-4201-0001
Ground Clamp for symmetric or asymmetric rail	03044-4202-0001
End Clamp for symmetric or asymmetric rail	03044-4203-0001
Blank transmitter configuration labels (sheet of 48)	00644-5154-0001

Hardware Tag

- No charge
- Tagged in accordance with customer requirements
- Tags are adhesive labels
- Permanently attached to transmitter
- Character height is $^{1}/_{16}$-in (1.6 mm)

Software Tag

- The transmitter can store up to 8 characters in its memory
- Transmitter can be ordered with different software and hardware tags
- If the software tag characters are not specified, the software tag will default to the first 30 characters of the hardware tag.

Configuration

Unless specified, the transmitter will be shipped as follows:

Sensor Type:	RTD, Pt 100 (α = 0.00385, 4-wire)
4 mA Value:	0 °C
20 mA Value:	100 °C
Damping:	5 seconds
Failure Mode:	High/Upscale
LIne Voltage Filter:	50 Hz
Tag	See “Hardware Tag” on page Temperature-99 and “Software Tag” on page Temperature-99

Custom Configuration

The transmitter can be ordered with custom configuration. Use the following table to determine the requirements when specifying the custom configuration.

Option Code	Requirements/Specification
A1: NAMUR-compliant	See Table 1 on page Temperature-93
CN: NAMUR-Compliant, Low Alarm	See Table 1 on page Temperature-93
C4: Five Point Calibration	Will include five-point calibration at 0, 25, 50, 75, and 100% analog and digital output points. Use with Rosemount Calibration Certificate Q4.
F6: 60 Hz Line Filter	Calibrated to a 60 Hz line voltage filter instead of the standard 50 Hz filter

Configuration Software

The PC-based configuration software for the Rosemount 244ER allows comprehensive configuration of the transmitters. Used in conjunction with a 244EC Configuration Interface, the software provides the tools necessary to configure and view the process variable of a 244ER. Using the software, the following parameters are available:

- Process Variable
- Sensor type
- Number of Wires
- 50/60 Hz selection
- Engineering Units
- Upper and lower range values
- Damping value
- Transmitter electronic tag

Software for the 244EC is available in English, French, German, Italian, Spanish, Chinese, Japanese, and Korean. A spreadsheet for printing labels and one sheet of labels are included with the software. The labels can be used when the transmitter configuration has been changed. The user can place a new label on the transmitter to reflect the new configuration parameter.

Rosemount 244EC Configuration Interface

The 244EC Configuration interface is a portable, self-contained communication link between your PC and transmitter. The 244EC connects to the serial port on your PC with a standard 9-pin interconnecting plug and to a transmitter using two MINIGRABBER™ clips. Power is provided by one replaceable 9-volt battery. The 244EC will also operate using a wall power adapter. The 244EC is approved for Factory Mutual (FM) and Canadian Standards Association (CSA) Ordinary Locations.

Rosemount 244ER

Emerson Process Management

Rosemount Inc.
8200 Market Boulevard
Chanhassen, MN 55317 USA
T (U.S.) 1-800-999-9307
T (International) (952) 906-8888
F (952) 949-7001

Rosemount Temperature GmbH
Frankenstrasse 21
63791 Karlstein
Germany
T 49 (6188) 992 0
F 49 (6188) 992 112

Emerson Process Management Asia Pacific Private Limited
1 Pandan Crescent
Singapore 128461
T (65) 6777 8211
F (65) 6777 0947
AP.RMT-Specialist@emersonprocess.com

www.rosemount.com

EMERSON™
Process Management