

# Rosemount Instruments

Rosemount Instruments Ltd  
808 - 55th Avenue N.E.  
Calgary, Alberta  
T2E 6Y4  
Tel (403) 275-8400  
Fax (403) 275-4331

NUMBER OF PAGES  
INCLUDING LEAD SHEET

9

DATE

96-12-20

TO

FROM

COMPANY Royal Oak Mines  
ATTENTION Brian Penney  
FAX NUMBER: 1-403-873-2914

SENDER: MARION ROWSOME  
DEPT. PROJECT MANAGEMENT  
DIRECT LINE: 730-3119 (CALGARY)  
TOLL FREE: 1-800-268-1151  
LOCAL FAX: 274-6727 (CALGARY)  
TOLL FREE FAX: 1-800-563-3051

SUBJECT: Revision 01, Quotation 97-33-20140 Rev 1  
Sulphur Dioxide Stack Monitoring System

Brian,

Please find attached Rosemount's revised quotation  
for your "Sulphur Dioxide Stack Monitoring System" requirements.

cc: Chris Martin (Analytical Spec.) Edm.  
Darcy Yakichuk (Account Rep.) Edm.

Regards,

*Marion*

Marion Rowsome

Project Coordinator

FISHER-ROSEMOUNT

# Rosemount Instruments

Rosemount Instruments Ltd  
808 - 55th Avenue N.E.  
Calgary, Alberta  
T2E 6Y4  
Tel (403) 275-8400  
Fax (403) 275-4331

December 20, 1996

Royal Oak Mines  
PO Bag #3020, Station Main  
Yellowknife, NWT

**Attention: Brian Penney**

**SUBJECT: Sulphur Dioxide Stack Monitoring System  
Rosemount Quotation: 97-33-20140REV.1**

Dear Brian:

We at Rosemount would like to thank you for this opportunity to quote on your requirements for the Sulphur Dioxide Stack Monitoring System.

As a world leader in Industrial Instrumentation, Rosemount offers reliable, field-proven products incorporating state-of-the-art technology. The design and performance of our products is unsurpassed by any other manufacturer in the market place today.

The system quoted will meet US EPA CFR 40 part 60 guidelines with regard to the SO<sub>2</sub> ppm concentration accuracy. Drift specs for the SO<sub>2</sub> analyzer zero and span will also be met.

Due to the low flow of this stack, flow certification will be very difficult to meet, therefore Rosemount will not guarantee this part of the certification process. The standard reference method used by the US EPA for stack flow certification is a pitot tube with liquid manometer. The lowest calibration point available for the technology is 3 meters/second, this stack is flowing at approximately 2.7 meters/second, well below the "baseline" of this technology.

The liquid manometer measures differential pressure (DP). This stack has a DP of approximately 0.025" Water Column (WC). The accuracy of the manometers is  $\pm .005$ "WC. If the manometer disagrees with the CEMS stacks flow measurement device by .005"WC (which is highly likely) this represents a difference of 20%.

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808 - 55th Avenue N.E.,  
Calgary, Alberta  
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December 19, 1996  
Royal Oak Mines  
Page 2.

Stack flows are normally much higher than 2.7 meters/second. But stacks like this one, which was built in 1951, do exist and represent a problem when certifying flow. Local governments typically are quite flexible when dealing with these low flow stacks and leave room for a large margin of error.

We have recently certified a CEMS in Canada in which all measures for stability and accuracy were well within specifications. The certifying agent was so impressed they are now investigating converting to Rosemount equipment for their certification system.

We look forward to providing you with our very best in products, service and support. If you have any questions please feel free to contact me at 1-800-268-1151.

Yours truly,

ROSEMOUNT INSTRUMENTS LTD



Marion Rowsome  
Project Coordinator

MR/kla

cc: Darcy Yakichuk, Acct. Rep. Edm.  
Chris Martin, Analytical Spec., Edm.

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# Rosemount Instruments

## QUOTATION

CUSTOMER SUPPORT CENTRE  
808 - 55th Avenue N.E.  
Calgary, Alberta T2E 6Y4  
Tel. (403) 275-8400  
Toll Free 1-800-268-1151  
Fax (403) 274-6727  
Toll Free Fax 1-800-563-3051

Page 1 of 6

**TO: Royal Oak Mines**  
PO Bag #3020, Station Main  
Yellowknife, NWT

Fax #: 403-873-2914  
Phone #: 403-669-3729  
Attn: Brian Penney

**QUOTE NO:** 97-33-20140REV.1  
**QUOTE DATE:** December 20, 1996  
**CUSTOMER REF:** Sulphur Dioxide Stack  
Monitoring System  
**TERMS:** NET 30 DAYS 1% 15, All Taxes Extra  
**FIRM QUOTE FOR:** 30 DAYS  
**F.C.A.:** Jobsite, Our Carrier, Prepaid and Allowed

| ITEM | QTY. | DESCRIPTION  | UNIT PRICE | TOTAL     |
|------|------|--|------------|-----------|
| 1    | 1    | <b>Rosemount Analytical<br/>Sulfur Dioxide Stack Monitoring System<br/>Consisting of:</b>  | 62,303.00  | 62,303.00 |
|      |      | A. Model 880A NDIR Analyzer<br>Matrix: 8803-6701-0100<br><br>Range: 0 - 4% SO <sub>2</sub><br>Output: 4 - 20mA, isolated   |            |           |
|      |      | B. Sample Handling System per drawing 832012-1   |            |           |
|      |      | C. Weather-proof (NEMA 12 with gasketing and drip-shield)<br>enclosure measuring 72" x 24" x 36" HWD, to include:  |            |           |
|      |      | * Front and rear access doors<br>* Window on front door<br>* Inlet and outlet bulkhead fittings<br>* Circuit breakers and junction boxes<br>* Calibration gas bottle mounting channel<br>* Heater<br>* Designed for ambient temperatures of -29°C to +32°C,<br>ambient humidity of 95%, and electrically safe area<br>* Items A - B above fully mounted, piped, and wired<br>* CSA inspected for General Purpose environment |            |           |

"No statement or condition contained in any order submitted by Buyer which modifies, adds to, is different from or inconsistent with any term or condition of this quotation shall be binding on the Seller unless the Seller shall have expressly consented in writing to such statement or condition. This Quotation is subject to the terms and conditions, warranties and disclaimers set forth in the text of Seller's Terms & Conditions and to no others unless specifically agreed to in writing."

**SHIPMENT EX FACTORY**  
**(After receipt of Written Contract**  
**and Subject to Prior Sale.)**  
All Items: 14 - 18 weeks

**ROSEMOUNT INSTRUMENTS LTD  
(THE SELLER)**

BY



Marion Rowsome  
Project Coordinator

cc:

Darcy Yakichuk, Account Rep., Edm.  
Chris Martin, Analytical Spec., Edm.

FISHER-ROSEMOUNT

All sales of goods here under are  
subject to availability of goods to  
Rosemount Instruments Ltd.

| ITEM | QTY. | DESCRIPTION   | UNIT PRICE | TOTAL     |
|------|------|---|------------|-----------|
| 2    | 1    | <b>Heat-traced sample line, plus temperature controller</b><br>Assumed approx. 150 feet required based on \$77.65/Ft.<br>1/4" ID Teflon Tube for sample<br>1/4" OD Teflon Tube for calibration gas<br>3/8" OD for Instrument Air<br>(good down to -70°C)<br>(will maintain sample temperature to 149°C) | 11,647.00  | 11,647.00 |
| 3    | 1    | <b>Automatic zero and span for system</b><br>Includes zero/span card for Model 880A as well as electric valve.  | 3,131.00   | 3,131.00  |
| 4    | 1    | <b>Volumetric Flow Monitoring System</b><br>Rosemount differential Pitot Flow Element<br>6 inch Flange Mount<br>Integral Temperature Measure<br>(Thermocouple K-Type with transmitter)<br>Blowback Assembly and Dual 4 Way Solenoid Valves<br>Direct Flange Mounting                                    | 8,500.00   | 8,500.00  |

**Total Hardware Costs:**

**\$85,581.00**

**Drawings**

Drawings for customer review will be available 4-6 weeks after receipt and acceptance of original signed purchase order and complete information required to develop the system.

One reproducible (vellum) set of documentation or one disk (AutoCad rel.12) with the following will be provided at no charge:

- \* Flow Diagram
- \* Cabinet Outline and Mounting Dimension
- \* Electrical Interconnect Diagram

Additional sets of drawings are available at \$71.00 per set.

**Manuals**

System to include one Systems Manual with final "as built" details available 2-4 weeks after date of shipment.

Additional Systems Manuals are available at \$142.00 per set.

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808 - 55th Avenue N.E.  
Calgary, Alberta  
T2E 6Y4

QUOTATION No. 97-33-20140REV.1

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| ITEM | QTY. | DESCRIPTION | UNIT PRICE | TOTAL |
|------|------|-------------|------------|-------|
|------|------|-------------|------------|-------|

**Shipment**

Method of shipment will be by air-ride van.

**Service Costs**

Hourly rate of \$115.00 plus expenses at cost. Allow 2 weeks for commissioning assistance. Rosemount will only bill for services required. Please budget approximately \$15,000.00 for these services. Rosemount assumes site will install cabinet, sample probe, sample cable, flow measuring device, temperature measuring device, and all necessary cabling back to the cabinet. Rosemount will assist with start-up of system, configuration, calibration, and hands-on training.

**Total Commissioning Costs:**

**\$15,000.00**

**Total Price:**

**\$100,581.00**

\kla

## SYSTEM DESCRIPTION

The proposed Rosemount Analytical sulfur dioxide stack gas monitoring system consists of a Model 880A NDIR analyzer, sample handling system per drawing 832012-1, and weather-proof cabinet.

### Analyzer

The Model 880A is a microprocessor-controlled infrared analyzer utilizing the Luft detector technology. User-friendly software provides for ease of operation and calibration, with the convenience of complete set-up and operation from the front panel keyboard. A constant current source drive with quartz crystal-controlled chopper motor enhances stability and performance, providing complete isolation from power line frequency variations. An LCD display provides reading in either percent of full scale, or direct reading of component concentration when used in conjunction with the linearizer.

### Sample Handling System

A typical sample handling system is illustrated on drawing 832012-1, based on the stream composition as detailed on attached stream analysis sheet. In the event of an order, the system configuration may be revised according to the most current "sound engineering practice". The following features are included:

1. A 7' sample probe with 3" mounting flange assembly, and heated enclosure with valves for blow-back of the probe and introduction of calibration gases, are supplied loose for customer mounting at the stack.
2. A four-way air-operated valve, as controlled by a solenoid valve and timer, will introduce sample into the system. Alternately, it will provide for blow-back of the sample probe using instrument air, and introduction of calibration gases at the probe.
3. Water vapor and other condensables will be removed via a dual path thermoelectric water condenser. A dual-headed peristaltic pump provides a continuous drain.
4. A stainless steel sample pump with Teflon-coated neoprene diaphragm pressurizes and transports the sample to the analyzer.
5. Multiple stage filtration is provided, including a coalescing primary filter, and a sintered element guard filter (7 micron) just prior to the analyzer to protect it from any residual particulates.
6. A five-way automatic solenoid valve allows for calibration gas introduction just prior to the analyzer and a manual valve provides for introduction of calibration gases at the sample probe (for a system check). Calibration gases should be introduced at essentially the same flow rate and pressure as the sample.
7. Flowmeters are provided for the analyzer and bypass to adjust sample flow rate and system lag time, respectively.
8. Materials in contact with the sample include 316 stainless steel, Viton, Teflon, and glass.
9. The system is designed for a stack temperature of up to 480°C. It is assumed the sample contains no HCl or SO<sub>3</sub>, and that the particulate level is less than 250mg/m<sup>3</sup>.

## STREAM ANALYSIS

**WE ASSUME THE FOLLOWING:** Trace is defined as 1.0% or less of lowest stated component concentration. All stated values vary not more than  $\pm 10\%$  unless otherwise stated. No component will polymerize, decompose, or otherwise react. No other components will be present during upset conditions. Sample is a single phase sample. Sample and bypass vents will be to atmospheric pressure.

UNITS OF CONCENTRATION ARE: volume %

| <u>Component</u> | <u>Concentration</u>    | <u>Ranges</u> |
|------------------|-------------------------|---------------|
| Oxygen           | 17.557%                 |               |
| Carbon Dioxide   | 0.924                   |               |
| Nitrogen         | 73.881                  |               |
| Water            | 7.638                   |               |
| Carbon Monoxide  | 0                       |               |
| Sulfur Dioxide   | < 2                     | 0-4%          |
| Particulates*    | < 250 mg/m <sup>3</sup> |               |
| SAMPLE PHASE:    | vapor                   |               |
| TEMPERATURE:     | 93.7°C                  |               |
| PRESSURE:        | atmospheric             |               |

\* Assumed - Based on TEST One

PLEASE NOTE that we assume NO ARSENIC OR OXIDES OF ARSENIC will be present in the sample in a vapor state.

NOTE: It is assumed that there is no HCl, SO<sub>2</sub>, or other corrosive components in the sample.



|  |   |                          |
|--|---|--------------------------|
| <b>Shipping List</b>                                     | <b>Ship To:</b><br><b>Fisher Rosemount Canada/Royal Oak Mines</b> | <b>Foreign Dept. No.</b> |
| <b>Sales Order No.</b><br><b>SY 10206</b><br>Page 1 Of 2 |   | <b>Model No.</b>         |

Only those items checked are included with your instrument. Please check each item when unpacked and report any shortage immediately.

Shipping damage should be reported to the carrier.

**M-Day**

6/25/97

| Part No. | Item No. | Description  | Qty.     | Serial Number | Factory Check | Box/ Crate No. |
|----------|----------|--|----------|---------------|---------------|----------------|
| 775268   | 1        | Sulfur Dioxide Monitoring System Mounted In NEMA 3R Enclosure            | 1        |               |               |                |
| 775270   | 2        | Probe/Calibration Valve Enclosure  | 1        |               |               |                |
| 775287   | 3        | Sample Probe   | 1        |               |               |                |
|          | 4        | Set Of Gaskets, Nuts, and Washers For 3 Inch 150 Lb. ASA RF Flange       | 1<br>1   |               |               |                |
|          | 5        | Furon Seal 2.75 Heat Shrink Boot   | 2        |               |               |                |
|          | 6        | Furon Seal 1.60 Heat Shrink Boot   | 1        |               |               |                |
|          | 7        | Cellex P/N ME-2T1-56-1-3T1-2T1-ATP-040-3/12-4/10 Heat Traced Sample Line | 130 Feet |               |               |                |
|          | 8        | Porous Media P/N IE10024E03-RA Filter Elements                           | 9        |               |               |                |
|          | 9        | Balston P/N 100-12-BX Filter Elements                                    | 3        |               |               |                |
|          | 10       | Porous Media P/N IC10024E03-RA Filter Elements                           | 9        |               |               |                |
|          | 11       | Cellex P/N SE-2T1-07-1-ATP-040 Heat Traced Sample Line (Pitot Tube Air)  | 6 Feet   |               |               |                |
|          | 12       | Cellex P/N TBX-4LC Seal Kit  | 1        |               |               |                |

**Shipping Instructions:**

**Rosemount Analytical Inc.**  
600 S. Harbor Blvd.  
La Habra, CA 90631

**Shipping Approval:**

*Shirley A. Deyan*

**Inspected By:**

*Brian Wilkins*

6/26/97

**Foreign Dept. No.**

|   |  |                          |
|---|--|--------------------------|
| <b>Shipping List</b>                              | <b>Ship To:</b>                                | <b>Foreign Dept. No.</b> |
| <b>Sales Order No.</b><br>SY 10206<br>Page 2 Of 2 | <b>Fisher Rosemount Canada/Royal Oak Mines</b> | <b>Model No.</b>         |

Only those items checked are included with your instrument. Please check each item when unpacked and report any shortage immediately.

Shipping damage should be reported to the carrier.

**M-Day**  
6/25/97

| Part No. | Item No. | Description                 | Qty. | Serial Number | Factory Check | Box / Crate No. |
|----------|----------|-----------------------------|------|---------------|---------------|-----------------|
|          | 13       | Cellex P/N ET-7C Seal Kit   | 1    |               |               |                 |
|          | 14       | Cellex P/N TBX-3LC Seal Kit | 1    |               |               |                 |
|          | 15       | Cellex P/N ET-8C Seal Kit   | 1    |               |               |                 |
|          | 16       | Cellex P/N FAK-7 Seal Kit   | 1    |               |               |                 |
|          | 17       | System Instruction Manuals  | 2    |               |               |                 |
|          | 18       | Set Of System Drawings      | 1    |               |               |                 |
|          |          |                             |      |               |               |                 |
|          |          |                             |      |               |               |                 |
|          |          |                             |      |               |               |                 |
|          |          |                             |      |               |               |                 |
|          |          |                             |      |               |               |                 |

**Shipping Instructions:**

**Rosemount Analytical Inc.**  
600 S. Harbor Blvd.  
La Habra, CA 90631

**Shipping Approval:**

*John Degen*

**Inspected By:**

*Bill Wilkins 6/26/97*

**Foreign Dept. No.**

Rosemount Instruments Ltd  
808 - 55 Avenue N.E.  
Calgary, AB T2E 6Y4  
1-403-730-3100

## TRANSMITTAL

Transmittal Number: 1

**SHIP TO:**

Royal Oak Mines Inc.  
Yellowknife Division  
Yellowknife, NWT  
X1A 2M2  
Attention: Stephen Schultz

DATE: April 29, 1997

CUSTOMER REFERENCE:  
P.O.#154788  
Stack Monitoring System  
ROSEMOUNT REFERENCE:  
S/O#944255

**In compliance with the data requirements of your Purchase Order find enclosed the following documentation**

**X**

**Data for Approval  
Approval is Required  
Before Actual Manufacture Proceeds.**

| ITEMS | ROSEMOUNT DOCUMENTS NO. | QUANTITY | DOCUMENT TITLE                              |
|-------|-------------------------|----------|---|
| 1     | 775267 Rev. B           | 2 Prints | Flow Diagram                                |
| 2     | 775269 Rev. A           | 2 Prints | Interconnect Wiring Diagram (3 Sheets)      |
| 3     | 775270 Rev. A           | 2 Prints | Outline and Mounting Dimensions - Probe Box |
| 4     | 775287 Rev. A           | 2 Prints | Sample Probe with Filter                    |
| 5     | 775268 Rev. A           | 2 Prints | Outline and Mounting Dimensions             |

For further assistance please contact the undersigned.

M. Rowsome, Project Coordinator

Page 1 of 1

Dwg. require  
approval!

(April 29/97!)