

# APPROVAL REPORT

## MODEL SC14ST AND SC22ST SONOCELL TRANSDUCERS FOR HAZARDOUS (CLASSIFIED) LOCATIONS

PREPARED FOR:

KISTLER-MORSE CORPORATION  
19021-120TH AVE. N.E.  
BOTHELL, WA 98011-9511

J.I. 0B5A1.AX  
(3600)  
MARCH 27, 1996



### **Factory Mutual Research**

1151 Boston-Providence Turnpike  
P.O. Box 9102  
Norwood, Massachusetts 02062



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FROM  
KISTLER-MORSE CORPORATION  
19021-120TH AVE. N.E.  
BOTHELL, WASHINGTON 98011

## I INTRODUCTION

1.1 Kistler-Morse Corporation requested examination of the apparatus listed in Section 1.2 to be in compliance with the applicable requirements of the following standards:

<u>Title</u>	<u>Class No.</u>	<u>Issue Date</u>
Electrical Equipment for Use In Hazardous (Classified) Locations General Requirements	3600	March 1989
Electrical and Electronic Test, Measuring, and Process Control Equipment	3810	March 1989

1.2 The following was evaluated as suitable for Class I, II, III Division 1, Group C, D, E, F and G hazardous locations when installed per Kistler-Morse Drawing Number TI-0121, Rev. L and will appear in the Approval Guide as follows:

S/I,II,III/1/CDEFG - TI-0121/L

Sonocell Transducer. Models SC22ST and SC14ST.

**FACTORY MUTUAL RESEARCH CORPORATION**  
**Job Identification 0B5A1.AX**

**II**     DESCRIPTION

2.1 The transducers are used in conjunction with the Kistler-Morse Sonologic Level Indication System. The system is designed to indicate the level of material within a vessel. The electronics of the Sonologic Level apparatus produce a 400V peak pulsed signal at a frequency of 15KHz to 35KHz which is supplied to the transducer. The transducer emits a signal proportional to the input signal inside the containment vessel. The time the emitted signal takes to return back to the transducer is proportional to the level of the vessel. This information is fed back to the Sonologic Indication System and a level amount is indicated. The Sonologic instrumentation is located outside the hazardous location.

2.2 The transducers are housed within a stainless steel housing. Model SC14ST measures 17.78cm (7in.) long and 12cm (4.75 in.) in diameter. Model SC22ST measures 14.6cm (5.75in.) long and 12cm (4.75 in.) in diameter. Both version contain a 1.25in. NPT conduit connector. The transducer is a two wire device which contains a 100K $\Omega$ , 5%, 1W carbon resistor and a piezoelectric disk and is completely encapsulated within a potting compound, Sylgard 170.

**III**   EXAMINATION AND TESTS

3.1 Representative samples of the Sonocell Transducer were tested and examined by Factory Mutual Research Corporation (FMRC) to determine their acceptability for use in the specified hazardous locations. The examination included fault analysis, temperature measurements as well review of the manufacturer's documentation and the unit's physical construction. All were satisfactory and are summarized in the following sections.

3.2 Sonocell Transducer Evaluation - The transducers are designed with no arcing or sparking components which would cause ignition. The acceptance of the probe in a Class I, Division 1 Group C and D hazardous location is based on encapsulation of the final assembly. Testing outlined below verifies this construction technique for use in the specified hazardous location.

3.2.1 Over Voltage Test - A sample of each transducer was subjected to a fault voltage of 250Vrms. The fault voltage was applied across the power input leads. The voltage was applied until thermal equilibrium was attained. The test was satisfactory in that there was no discernable damage to the sample.

3.2.2 Dielectric Voltage Withstand Test - Upon completion of the over voltage test the samples were subjected to 4000Vrms between the power input leads connected together and the enclosure and the power input leads connected together and the front plate. The results were satisfactory. There was no leakage or breakdown in the test potential after being applied for 1 minute.

3.2.3 Temperature Test - Temperature testing confirmed that the transducers do not contain components which generate sufficient heat to cause a significant rise in temperature based on an ambient temperature of 40°C (104°F). No temperature marking is required.

3.2.4 Encapsulant Material Evaluation - The transducers are flooded with Dow Corning Sylgard 170 two part silicone elastomer. The material was satisfactorily evaluated under J. I. 2R7A5.AX for material compatibility, artificial aging and flammability. A review of the test notebook, report and documentation revealed no additional testing is required. The elastomer has a minimum melt/appreciable soften temperature of 250°C (482°F).

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3.2.5 Installation Requirements - Acceptance of the transducer for use in the specific hazardous locations requires the use of rigid metal conduit and an Approved explosionproof seal mounted adjacent to transducer.

3.3 Class II and III, Division 1 Evaluation - The acceptance of transducers in a Class II, III, Division 1, Group E, F and G hazardous locations is based on meeting the requirements of an encapsulated assembly. In addition, the encapsulation material has been satisfactorily evaluated under Section 3.2.1 - 3.2.4 to ensure that it will not degrade when exposed to specific hazardous location gasses.

IV     MARKING

Marking meets requirements as illustrated in the attachments.

V       REMARKS

5.1 Electrical equipment connected to associated apparatus should not use or generate more than 250 Vrms.

5.2 Tempering or replacement with non-factory components may adversely affect safe use of the system.

5.3 Installation should be in accordance with the National Electrical Code (ANSI/NFPA 70) and the manufacturers instruction manual.

VI     FACILITIES AND PROCEDURES AUDIT

The manufacturing site at Bothell, WA was examined with regard to facilities and quality control procedures and results were satisfactory in that the level of performance which produced the item which was tested was maintained.

VII    MANUFACTURER'S RESPONSIBILITIES

7.1 The documentation listed under Section VIII is applicable to this Approval and is on file at FMRC. No changes of any nature shall be made unless notice of the proposed change has been given and written authorization obtained from FMRC. The Approved Product-Revision Report, FMRC Form 797 shall be forwarded to FMRC as notice of proposed changes.

7.2 The manufacturer shall supply the end user a copy of the wiring diagram TI-0121.

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VIII DOCUMENTATION

The attached documentation are applicable to this Approval and is on file at FMRC.

<u>Drawing No.</u>	<u>Revision</u>	<u>Title</u>
91-2041	C	Label Sonocell FM Approved
TI-0121	L	Installation FM Approved Sonocell
64-8010	B	Final/Shipping Assy 50ft. SS Sonocell
64-8007	B	Final/Shipping Assy 100ft. SS Sonocell

IX CONCLUSION

The apparatus described in Section 1.2 meets FMRC requirements. Approval is effective when the Approval Agreement is signed and received by FMRC.

EXAMINATION AND TESTS BY:

Gary Kozinski, Paul Finn

ATTACHMENTS:

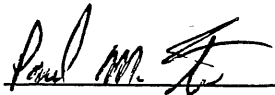
Wiring Diagram TI-0121  
Label 91-2041

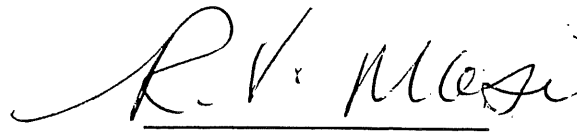
ORIGINAL TEST DATA:

Project Data Record J.I. 0B5A1.AX

WRITTEN BY:

REVIEWED BY

  
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