



Factory Mutual Research

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(3611)

March 4, 1991

MODEL TT210, TT211, TT710 AND TT711
TWO WIRE TRANSMITTERS
FOR
HAZARDOUS LOCATIONS

from

MINCO PRODUCTS INCORPORATED
7300 COMMERCE LANE
MINNEAPOLIS, MINNESOTA 55432

I INTRODUCTION

1.1 Minco Products Incorporated requested Approval of the apparatus listed in Section 1.2 to be in compliance with the applicable requirements of the following standards:

<u>Title</u>	<u>No.</u>	<u>Issue Date</u>
Electrical Equipment for Use in Class I, Division 2, Class II, Division 2 and Class III, Division 1 and 2 Hazardous Locations	3611	April 1986
Electrical and Electronic Test, Measuring, and Process Control Equipment	3810	March 1989
Electrical Equipment for Use in Hazardous (Classified) Locations General Requirements	3600	March 1989

1.2 The following was evaluated as nonincendive for use in Class I, Division 2, Groups A, B, C and D indoor hazardous locations and will appear in the Approval Guide as follows:

NI/I/2/ABCD

Two Wire Transmitter. Model TT210Palbc, TT211Palbc, TT710Palbc and TT711Palbc.

- a - Temperature element A through Z.
- b - Temperature designation A through Z.
- c - Temperature designation A through Z or blank.

II DESCRIPTION

2.1 The transmitters detailed within Section 1.2 are two wire RTD transmitters containing identical electronics encapsulated within a molded plastic housing. The difference between the TT210 and the TT211 are the wiring connections. The TT210 utilizes flying leads while the TT211 contains a compression type terminal block. In addition, the TT210 is calibrated to a specific RTD while the TT211 is calibrated to a nominal curve. The same differences hold true for the TT710 and TT711 transmitters. Each of the transmitter models utilizes a supply voltage between 8.5 to 35 VDC while generating an output of 4-20 mA over a specified temperature range.

2.2 The transmitters are a fixed installation device that is intended to be mounted in a vent-free enclosure, meeting the requirements of Section 3.4, with which only the Approved equipment will be installed. All unused openings should be sealed. Installation must be in accordance with the manufacturer's installation and operation manual.

III EXAMINATION AND TESTS

3.1 General

A representative sample of each transmitter specified in Section 1.2 was examined and tested to determine their acceptability for use in the specified hazardous locations. The examination included circuit analysis and temperature measurements as well as a review of the manufacturer's documentation and the equipments physical construction. All were satisfactory and are summarized in the following sections.

3.2 Nonincendive Examination

3.2.1 Nonincendive equipment acceptability is based on the inability of an instrument to release sufficient electrical or thermal energy under normal operating conditions to cause ignition of a specific hazardous atmosphere.

3.2.2 The equipment listed in Section 1.2 was evaluated under normal conditions and maximum load to determine if any component was operating at a temperature to cause auto-ignition of a Group A, B, C or D test gas mixture. All temperature measurements were based on an ambient of 104°F (40°C). The maximum temperature measured on the external surface of the potting compound material was 165°F (74°C). Accordingly, in accordance with the National Electrical Code, temperature ratings will not be required.

3.2.3 As the transmitters are completely encapsulated, there are no normally arcing or sparking devices associated with the devices. No further analysis was deemed necessary.

3.3 Electrical Utilization Examination

3.3.1 Electrical utilization equipment acceptability is based on the ability of the equipment to minimize the risk of electrical shock, injury and fire.

3.3.2 There are no live or moving parts which are accessible to the operator. Protection is afforded by the use of an enclosure (Ref. Section 3.4), requiring the use of a tool to gain access to internal energized parts.

3.3.3 Analysis determined that since the transmitters are completely encapsulated within a plastic housing, there are no accessible conductive parts of the equipment which could become live in the event of a fault. In addition, the transmitters are contained within the enclosure described in Section 3.4. The enclosure shall be provided with a protective ground terminal which is equivalent to the size of the supply circuit conductor terminals and appropriately marked.

3.3.4 Insulating materials of the transmitters were not subjected to fire testing based on the fact that insulating materials have a flammability rating of 94V-0.

3.3.5 Dielectric voltage withstand testing was conducted on the transmitters between the input and output wiring connections. A test voltage of 500 Vrms was applied between these points for a period of one minute. There was no breakdown of the potential during this time period verifying the transmitters afford the required degree of protection.

3.3.6 The spacings between conductors were inspected. The spacings between uninsulated parts conductively connected to the primary circuit and i) uninsulated parts conductively connected to another pole of the primary circuit, ii) uninsulated parts of any other circuit, iii) grounded parts, are equal to or greater than 0.020 inches (0.5 mm). In addition each transmitter is housed within a grounded enclosure, thereby providing isolation between wiring, the enclosure and each other.

3.4 Electrical Utilization Enclosure Requirements

3.4.1 Each of the transmitters listed in Section 1.2 must be mounted within an enclosure to prevent personal injury resulting from accessibility to live parts. This enclosure was not examined as part of this Approval but was considered to comply with the requirements of this Section.

3.4.2 Accessibility - The transmitters must be installed within the enclosure so that its circuits are accessible by the use of a tool only. A part is accessible when a.) the IEC articulate accessibility probe applied in every possible position to the exterior or exposed surfaces, including the bottom; or b.) the IEC rigid accessibility probe applied with a maximum force of 30 newtons (6.75 lbs force) in every possible position to the exterior or exposed surface, including the bottom, touches the part.

3.4.3 Protection From Fire - If the enclosure is non-metallic, it shall have the proper flammability rating as detailed within ANSI/ISA Standard S82.01.

3.4.4 Grounding - A metallic enclosure must have a protective grounding terminal and marked as such. All accessible noncurrent conductive parts must be bonded to the protective grounding terminal.

3.4.5 General Construction - The equipment enclosure, or parts of the enclosure, required to be in place to comply with the requirements for protection from electric shock, personal injury, protection of internal parts and wiring and external cord and cable assembly strain relief shall comply with the following tests for mechanical strength:

a. Impact Tests - The equipment shall be held firmly against a rigid support and shall be subjected to sets of three blows from a spring-operated impact hammer. The hammer shall be applied to any external part that when broken is likely to expose live parts. A window of an indicating device shall withstand an impact of 0.085 Newton-meter (0.753 pound force-inch) from a hollow steel impact sphere 50.8 mm (2 inches) in diameter and an approximate mass of 113.4 grams (4 ounces).

b. Pressure Tests - A force of 90 Newtons (20 pounds) shall be applied from a metal rod 12.7 mm (.50 inch) in diameter, the end of which is rounded. The force shall be applied for one minute to any point on the overall enclosure except the bottom. The bottom shall sustain a force of 65 Newtons (15 pounds).

c. Tip Stability Test - Equipment having a weight of 11 kilograms (24 pounds) or more shall not tip over when placed at the center of an inclined plane that makes an angle of 10 degrees with the horizontal and then turned to the position (with all doors, drawers and other openable and sliding parts in the least stable position) most likely to cause tip-over.

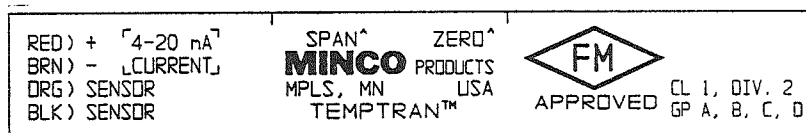
d. Sharp Edges - An accessible edge, projection, or corner of an enclosure, opening, frame, guard, handle, or the like shall be smooth and well rounded, and shall not cause a cut-type injury during normal use of the equipment.

OT5A1.AX

Page 5

IV MARKING

The following information appears on the apparatus identified in Section 1.2 and meets FMRC requirements. The labels are visible only with the protective enclosure, Section 3.4, cover removed.



MODEL TT710PD1AP
D/C 9108 S/N 105
20°F = 97.392 Ω
70°F = 108.224 Ω

Sample labels not to scale

V REMARKS

5.1 Installation shall be in accord with the manufacturer's instructions and the National Electrical Code.

5.2 Tampering and replacement with nonfactory components may adversely affect the safe use of the system.

5.4 Connection/disconnection of RTD wiring, to the transmitter, may only be accomplished when the area is known to be nonhazardous.

VI FACILITIES AND PROCEDURES AUDIT

Minco Products Incorporated has design and manufacturing facilities in Minneapolis, Minnesota that are subject to follow-up audit inspections. The facilities and quality control procedures in place have been found satisfactory to manufacture product identical to that examined and tested as described herein.

VII MANUFACTURER'S RESPONSIBILITIES

7.1 Documentation that is applicable to this approval is on file at Factory Mutual Research Corporation and listed in Documentation File, Section IX, of this report. No changes of any nature shall be made unless notice of the proposed change has been given and written authorization obtained from Factory Mutual Research Corporation. The Approved Product - Revision Report, Factory Mutual Research Corporation Form 797, shall be forwarded to Factory Mutual Research Corporation as notice of proposed changes.

7.2 The manufacturer shall inform the end user of details of the equipment enclosure requirements. Further enclosure requirement (reference Section 3.4) details may be found in ANSI/ISA S82.01, S82.02 and S82.03 Standard.

7.3 The manufacturer shall inform the end user that termination of the Model TT210 and TT710 transmitter field wiring must be made to a terminal strip, within the protective enclosure, that meets the spacing requirements found within ANSI/ISA Standard S82.01.

VIII CONCLUSION

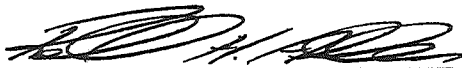
The apparatus described in Section 1.2 meets Factory Mutual Research Corporation requirements. Approval is granted when the Approval Agreement is signed and received by Factory Mutual Research Corporation.

EXAMINATION AND TESTS BY: R. H. Allen

ORIGINAL DATA: Test Notebook No. 91-115

WRITTEN BY:

REVIEWED BY:



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IX DOCUMENTATION FILE

<u>Document No.</u>	<u>Revision</u>	<u>Title</u>
395-00047	A	TT210/TT211/TT710/TT711 Schematic Diagram
390-00097	A	TT210/TT211/TT710/TT711 Assembly Drawing
390-00101	A	Bill Of Material For TEMPTRAN Models TT210/TT211/TT710 and TT711
TT211	N/C	TEMPTRAN Temperature Transmitter Model TT211
TT210	N/C	TEMPTRAN Temperature Transmitter Model TT210
TT711	A	TEMPTRAN Temperature Transmitter Model TT711
TT710	A	TEMPTRAN Temperature Transmitter Model TT710
330-60004	N/C	TT210/TT710 Case Label Drawing
330-60007	N/C	TT211/TT711 Case Label Drawing
330-60016	N/C	TT210/TT211/TT710/TT711 Case Label Drawing