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# TEST REPORT

**Project No:** 3049988  
**Supplements Project No.:** 3035158, 3041169, 3041022, 3041555, 3047245, 3048394  
**Class:** 3610  
**Product Name:** ProToF Modules: TRC [01,04,05,06,07,08,09,16,17,21,26,27]  
**Product Type:** Sub-assembly Modules  
**Name of Listing Company:** Endress+Hauser GmbH+Co KG  
**Address of Listing Company:** Hauptstrasse 1  
Postfach 1261  
Maulburg D79689  
Germany  
**Customer ID:** 1000001123-2  
**Customer website** www.endress.com

**Prepared by**

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Cheryl Gagliardi

Technical Team Manager

**September 10, 2014**

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**Date of Issue**

## 1 INTRODUCTION

1.1 Endress+Hauser GmbH+Co KG requested an examination of the ProToF TRC [01,04,05,06,07,08,09,16,17,21,26,27] modules listed in Section 1.4 for compliance with the standards listed in Section 1.3. The modules are assessed for assignment of the following hazardous locations protection ratings when it is installed in the Endress+Hauser ProToF final assembly:

### **TRC[01], TRC[21] Model ProToF IO210, IO210 2**

- Intrinsically Safe for Class I, Division 1, Group ABCD
- Intrinsically Safe for Class I, Zone 0, Group IIC
- Nonincendive for Class I, Division 2, Groups ABCD
- Nonsparking with Limited Energy Outputs for Class I, Zone 2, Group IIC
- Limited Energy for Class I, Zone 2, Groups IIC
- Intrinsically Safe for Class I, Zone 2, Group IIC

### **TRC[04], TRC[05] Model IO214/216, IO215/217**

- Intrinsically Safe for Class I, Division 1, Group ABCD
- Intrinsically Safe for Class I, Zone 0, Group IIC
- Nonincendive for Class I, Division 2, Groups ABCD
- Nonsparking with Limited Energy Outputs for Class I, Zone 2, Group IIC
- Limited Energy for Class I, Zone 2, Groups IIC
- Intrinsically Safe for Class I, Zone 2, Group IIC

### **TRC[06]/[07], TRC[26]/[27] Model IO220/2221, IO220/221 2**

- Intrinsically Safe for Class I, Division 1, Group ABCD
- Intrinsically Safe for Class I, Zone 0, Group IIC
- Nonincendive for Class I, Division 2, Groups ABCD
- Nonsparking with Limited Energy Outputs for Class I, Zone 2, Group IIC
- Limited Energy for Class I, Zone 2, Groups IIC
- Intrinsically Safe for Class I, Zone 2, Group IIC

### **TRC[08], TRC[09] Model IO410, IO411**

- Intrinsically Safe for Class I, Division 1, Group ABCD
- Intrinsically Safe for Class I, Zone 0, Group IIC
- Nonincendive for Class I, Division 2, Groups ABCD
- Nonsparking with Limited Energy Outputs for Class I, Zone 2, Group IIC
- Limited Energy for Class I, Zone 2, Groups IIC
- Intrinsically Safe for Class I, Zone 2, Group IIC

### **TRC[16], TRC[17] Model OVP10, OVP20**

- Intrinsically Safe for Class I, Division 1, Group ABCD
- Intrinsically Safe for Class I, Zone 0, Group IIC
- Nonincendive for Class I, Division 2, Groups ABCD
- Nonsparking with Limited Energy Outputs for Class I, Zone 2, Group IIC
- Limited Energy for Class I, Zone 2, Groups IIC
- Intrinsically Safe for Class I, Zone 2, Group IIC

### **FHX50 Remote Display inc/TRC[18], TRC[19] Modules**

- Intrinsically Safe for Class I, Division 1, Group ABCD
- Intrinsically Safe for Class I, Zone 0, Group IIC
- Nonincendive for Class I, Division 2, Groups ABCD

- Type 4X/6P

1.2 This report may be freely reproduced only in its entirety and without modification.

### 1.3 Standards

#### 1.3.1 Canadian Standards

Title	Number	Issue Date
General Requirements – Canadian Electrical Code, Part II	CAN/CSA C22.2 No. 0-M91	2006
Non-Incendive Electrical Equipment for Use in Class I, Division 2 Hazardous Locations – Industrial Products	CAN/CSA C22.2 No. 213-M1987	2004
Intrinsically Safe and Non-incendive Electrical Equipment for use in Hazardous Locations	CAN C22.2 No.157-92	1992 (2006)
Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements	CSA C22.2 No. 1010.1	2004
Electrical Apparatus for Explosive Gas Atmospheres - Part 0: General Requirements	CSA C22.2 No. 60079-0	2011
Explosive atmospheres Part 11: Equipment protection by intrinsic safety “i”	CSA C22.2 No. 60079-11	2011
Explosive atmospheres Part 15: Equipment protection by type “n”	CSA C22.2 No. 60079-15	2012

### 1.4 Listing

The modules will not appear in the Approval Guide, an on-line resource of FM Approvals, as they are component modules to be used in a complete assembly. The modules are assessed for assignment of the following protection ratings when installed in the Endress+Hauser ProToF final assembly.

#### 1.4.1 Canadian Listings

Reference ANNEX A

## 2 DESCRIPTION

Endress+Hauser GmbH+Co KG ProToF TRC [01,04,05,06,07,08,09,16,17,21,26,27] modules are individual components each approved as shown in ANNEX A. The ProToF system consists of various communications components which include HART, Modbus, 4-20mA, Fieldbus, and Profibus, , an overvoltage protection module, and a remote display module.. The approved components when assembled together make up the final ProToF Level measurement system which provides the final mechanical and environmental protection.

Operation Temperature Ranges:

The ambient operating temperature range of the ProToF modules is -40°C to 85°C max.

Electrical data:

In type of protection intrinsic safety, connection of the above mentioned modules can only be made with the values listed on the following drawings: 960009767, 960009852, 960014987, 960009764, 960015386, and 960015564.

### 3 EXAMINATIONS AND TESTS

#### 3.1 Canadian Examination

The Canadian examination was based on the review of the CSA Test Reports listed below and FM Approvals Project ID 3049342. All data is on file at FM Approvals along with other documents and correspondence applicable to this program.

All testing and analysis considered appropriate was conducted and verified to be in compliance with the Standards defined in Section 1.3.

CSA2162140_2534416_DaTR
CSA2367039_2543914_DaTR
CSA2432268_2432268_DaTR
CSA2635489_2635489_DaTR

### 4 MARKING

No certification marking is applied to the modules. Marking is applied to the final assembly. The modules are identified by the TRC designation. The FHX50 Display Module marking is attached.

### 5 REMARKS

5.1 Installations in Canada shall comply with the relevant requirements of the Canadian Electrical Code (CSA C22.1).

5.2 Installations shall comply with the manufacturer's instructions.

5.3 The products(s) discussed in this report were certified by FM Approvals under a Type 3 Certification System as identified in ISO Guide 67.

### 6 SURVEILLANCE AUDIT

The design and manufacturing facilities at the following location(s) shall be visited on a routine basis. The facility processes and quality control procedures in place have been determined to be satisfactory to manufacture product identical to that tested and Approved. A Form 797 shall be submitted to FM Approvals for requesting to manufacture product at any additional or alternate manufacturing facilities which are not listed below.

**Design**

Endress+Hauser GmbH+Co KG  
Hauptstrasse 1

**Manufacturing**

Endress+Hauser GmbH+Co KG  
Hauptstrasse 1

**Design**

Endress+Hauser GmbH+Co KG  
Postfach 1261  
Maulburg  
D79689  
Germany

**Manufacturing**

Endress+Hauser GmbH+Co KG  
Postfach 1261  
Maulburg  
D79689  
Germany

Endress+Hauser GmbH+Co  
Division Level+Pressure U.S.A  
2350 Endress Place  
Greenwood, IN 46143, USA

Endress+Hauser (India) Automation  
Instrumentation Pvt, Ltd  
M-192 MICD, Waluj,  
Aurangabad 431136  
India

**7 MANUFACTURER'S RESPONSIBILITIES**

- 7.1 Documentation that is applicable to this approval is on file at FM Approvals and listed in the Documentation File, Section 8, 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 FM Approvals. The Approved Product - Revision Report, FM Approvals Form 797, shall be forwarded to FM Approvals as notice of proposed changes.
- 7.2 The manufacturer shall provide copies of Configuration Drawings XA01096FEN, 960009767, 960009852, 960014987, 960009764, 960015386, and 960015564 with the respective products. The manufacturer shall make additional copies available upon request.
- 7.3 The manufacturer shall make any Special Conditions of Use available to the user of the Product.
- 7.4 The manufacturer shall carry out verifications or tests listed in ANNEX A necessary to ensure that the electrical equipment produced complies with the documentation listed in section 8.
- 7.5 In accordance with the Master Agreement, the manufacturer shall make full and immediate disclosure to FM Approvals of all information concerning any defect in, or potential hazard of, the product or service manufactured or provided by the Customer which is Approved by, or being examined by, FM Approvals. The manufacturer shall make all necessary arrangements for the investigation of complaints / anomalies applicable to this approval and shall keep records of all complaints / anomalies including actions taken.

**8 DOCUMENTATION**

See attached blueprint reports 3035158, 3041169, 3041022, 3041555, 3047245, 3048394

**9 CONCLUSION**

- 9.1 The apparatus described in section 1.4.1 meets FM Approvals requirements. Since a duly signed Master Agreement is on file for this manufacturer, Canadian Approval is effective the date of this report.

**PROJECT DATA RECORD:** 3049988

**ATTACHMENTS:** Blueprint Reports: 3035158, 3041169, 3041022,  
3041555, 3047245, 3048394  
Label Drawing 960015900  
Configuration Drawings XA01096FEN, 960009767,  
960009852, 960014987, 960009764, 960015386,  
960015564

## ANNEX A

### **TRC[01], TRC[21] Terminal / Communications Module Model ProToF IO210**

IS / I / 1 / ABCD / T6 / T5 / T4 Ta = -40°C to +60°C/75°C/85°C; 960014987; Entity  
IS / I / 0 / Ex ia IIC / T6 / T5 / T4 Ta = -40°C to +60°C/75°C/85°C; 960014987; Entity  
NI / I / 2 / ABCD / T6 / T5 / T4 Ta = -40°C to +60°C/75°C/85°C; 960014987  
I / 2 Ex nA [nL] IIC / T6 / T5 / T4 Ta = -40°C to +60°C/75°C/85°C; 960014987  
I / 2 / Ex nL IIC / T6 / T5 / T4 Ta = -40°C to +60°C/75°C/85°C; 960014987  
I / 2 / Ex ic IIC / T6 / T5 / T4 Ta = -40°C to +60°C/75°C/85°C; 960014987

#### *Special Conditions of Use:*

- 1) This communication board is internal component of the final certified ProToF system assembly.
- 2) This communication board is open type product, thus mechanical and environmental protection of the module is assured by the enclosure of the final ProToF assembly.

Factory Tests: None

### **TRC[04], TRC[05] Terminal / Communications Module**

IS / I / 1 / ABCD / T6 / T5 / T4 Ta = -40°C to +60°C/75°C/85°C; 960009764; Entity  
IS / I / 0 / Ex ia IIC / T6 / T5 / T4 Ta = -40°C to +60°C/75°C/85°C; 960009764; Entity  
NI / I / 2 / ABCD / T6 / T5 / T4 Ta = -40°C to +60°C/75°C/85°C; 960009764  
I / 2 Ex nA [nL] IIC / T6 / T5 / T4 Ta = -40°C to +60°C/75°C/85°C; 960009764  
I / 2 / Ex nL IIC / T6 / T5 / T4 Ta = -40°C to +60°C/75°C/85°C; 960009764  
I / 2 / Ex ic IIC / T6 / T5 / T4 Ta = -40°C to +60°C/75°C/85°C; 960009764

#### *Special Conditions of Use:*

- 1) This communication board is internal component of the final certified ProToF system assembly.
- 2) This communication board is open type product, thus mechanical and environmental protection of the module is assured by the enclosure of the final ProToF assembly.

Factory Tests: None

### **TRC[06]/[07], TRC[26]/[27] Terminal / Communications Module Profibus, FF, SF**

IS / I / 1 / ABCD / T6 / T5 / T4 Ta = -40°C to +60°C/75°C/85°C; 960015386; Entity  
IS / I / 0 / Ex ia IIC / T6 / T5 / T4 Ta = -40°C to +60°C/75°C/85°C; 960015386; Entity  
NI / I / 2 / ABCD / T6 / T5 / T4 Ta = -40°C to +60°C/75°C/85°C; 960015386  
I / 2 Ex nA [nL] IIC / T6 / T5 / T4 Ta = -40°C to +60°C/75°C/85°C; 960015386  
I / 2 / Ex nL IIC / T6 / T5 / T4 Ta = -40°C to +60°C/75°C/85°C; 960015386  
I / 2 / Ex ic IIC / T6 / T5 / T4 Ta = -40°C to +60°C/75°C/85°C; 960015386

#### *Special Conditions of Use:*

None

Factory Tests:

Warning: The factory test(s) specified may present a hazard of injury to personnel and/or property and should only be performed by persons knowledgeable of such hazards and under conditions designed to minimize the possibility of injury.

Routine tests per 61010-1 shall be required on the final ProToF system assembly.

#### IO220/IO221, TRC[06]/[07]/[26]/[27]

A routine test for infallible transformers shall be performed, with a applied voltage of 1500 V for at least 60 seconds applied between the input windings (connector X100) and output windings (connector X200), according to 60079-11, clause 11.2.

**TRC[16]/[17] Overvoltage Protection Module**

IS / I / 1 / ABCD / T6 / T5 / T4 Ta = -40°C to +60°C/75°C/85°C; 960015564; Entity  
IS / I / 0 / Ex ia IIC / T6 / T5 / T4 Ta = -40°C to +60°C/75°C/85°C; 960015564; Entity  
NI / I / 2 / ABCD / T6 / T5 / T4 Ta = -40°C to +60°C/75°C/85°C; 960015564  
I / 2 Ex nA [nL] IIC / T6 / T5 / T4 Ta = -40°C to +60°C/75°C/85°C; 960015564  
I / 2 / Ex nL IIC / T6 / T5 / T4 Ta = -40°C to +60°C/75°C/85°C; 960015564  
I / 2 / Ex ic IIC / T6 / T5 / T4 Ta = -40°C to +60°C/75°C/85°C; 960015564

*Special Conditions of Use:*  
None

**Factory Tests:**

Warning: The factory test(s) specified may present a hazard of injury to personnel and/or property and should only be performed by persons knowledgeable of such hazards and under conditions designed to minimize the possibility of injury.

Routine tests per 61010-1 shall be required on the final ProToF system assembly.

**IO220/IO221, TRC[06]/[07]/[26]/[27]**

A routine test for infallible transformers shall be performed, with a applied voltage of 1500 V for at least 60 seconds applied between the input windings (connector X100) and output windings (connector X200), according to 60079-11, clause 11.2.

**TRC[08]/[09] Terminal / Communications Module Standard Fieldbus(4-20mA,HART)**

IS / I / 1 / ABCD / T6 / T5 / T4 Ta = -40°C to +60°C/75°C/85°C; 960009767/960009852; Entity  
IS / I / 0 / Ex ia IIC / T6 / T5 / T4 Ta = -40°C to +60°C/75°C/85°C; 960009767/960009852; Entity  
NI / I / 2 / ABCD / T6 / T5 / T4 Ta = -40°C to +60°C/75°C/85°C; 960009767/960009852  
I / 2 Ex nA [nL] IIC / T6 / T5 / T4 Ta = -40°C to +60°C/75°C/85°C; 960009767/960009852  
I / 2 / Ex nL IIC / T6 / T5 / T4 Ta = -40°C to +60°C/75°C/85°C; 960009767/960009852  
I / 2 / Ex ic IIC / T6 / T5 / T4 Ta = -40°C to +60°C/75°C/85°C; 960009767/960009852

*Special Conditions of Use:*

- 1) This communication board is internal component of the final certified ProToF system assembly.
- 2) This communication board is open type product, thus mechanical and environmental protection of the module is assured by the enclosure of the final ProToF assembly.

**Factory Tests:**

Warning: The factory test(s) specified may present a hazard of injury to personnel and/or property and should only be performed by persons knowledgeable of such hazards and under conditions designed to minimize the possibility of injury.

1) At the conclusion of manufacture, the board stack assembly shall withstand for one minute without breakdown, the application of the following ac potentials:

- a) 1000V for equipment rated 250V or less, and 1000V plus twice rated voltage for equipment rated at more than 250V between low voltage live parts and mounting plate if such circuits leave or enter the enclosure;



b) 1000V for equipment rated 250V or less, and 1000V plus twice rated voltage for equipment rated at more than 250V between live parts of low and extra-low voltage circuits and different low voltage circuits if such circuits leave or enter the enclosure;

c) 500V between extra low potential live parts and exposed non-current-carrying metal parts, ground terminal or the mounting plate, if such circuits leave or enter the enclosure.

2) A transformer, if provided, shall withstand for one minute without breakdown, the application of an AC potential of 1000V plus twice the max voltage of the winding applied between each winding and all other windings.

Notes:

1. As an alternative, potentials 20 percent higher may be applied for one second.
2. Where it is more convenient to do so, the dielectric strength tests may be made applying a direct current voltage instead of an AC voltage, provided that the voltage used is 1.414 times the values specified above.
3. Capacitors in the secondary circuit may be disconnected during the dielectric strength tests specified in Items 1(a) to (c).
4. The test specified in Item 1© shall be waived on grounded or Class 2 circuits.
5. Transformer manufacturer's agreement to perform Test No. 2 will be acceptable. Also, this test shall be waived on certified transformers.

***FHX50 Remote Display inc/TRC[18], TRC[19] Modules***

Class I / 1 / ABCD / Ta = -40°C to +80°C XA01096F / Type 4X/6P

Class I / Zone 0 / Ex ia IIC / Ta = -40°C to +80°C XA01096F / Type 4X/6P

Class I / 2 / ABCD / Ta = -40°C to +80°C XA01096F / Type 4X/6P

Factory Tests:

Warning: The factory test(s) specified may present a hazard of injury to personnel and/or property and should only be performed by persons knowledgeable of such hazards and under conditions designed to minimize the possibility of injury.

- 1) The equipment at the conclusion of manufacture, before shipment, shall withstand without breakdown, the application of 500 Vrms between inputs and ground for at least 60 seconds.