

(1) EC-TYPE EXAMINATION CERTIFICATE

(2) Equipment and protective systems intended for use in potentially explosive atmospheres - Directive 94/9/EC

- (3) EC-Type Examination Certificate Number: **KEMA 04ATEX1066** Issue Number: **3**
- (4) Equipment: **Vibration Sensors Model AC90.-....., AC91.-....., LP80.-....., LP81.-....., LP90.-..... and LP91.-.....**
- (5) Manufacturer: **Connection Technology Center, Inc**
- (6) Address: **7939 Rae Boulevard, Victor, New York, USA 14564**
- (7) This equipment and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.
- (8) KEMA Quality B.V., notified body number 0344 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the directive.
- The examination and test results are recorded in confidential test report number 213329800.
- (9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:
- | | | |
|--------------------------|---------------------------|--------------------------|
| EN 60079-0 : 2006 | EN 60079-11 : 2007 | EN60079-26 : 2007 |
| EN 61241-0 : 2006 | EN 61241-11 : 2006 | |
- (10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.
- (11) This EC-Type Examination Certificate relates only to the design, examination and tests of the specified equipment according to the Directive 94/9/EC. Further requirements of the directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.
- (12) The marking of the equipment shall include the following:

**II 1 G D****Ex ia IIC T3 or T4****Ex iaD A20 T150 °C or T105 °C**

This certificate is issued on March 24, 2010 and, as far as applicable, shall be revised before the date of cessation of presumption of conformity of (one of) the standards mentioned above as communicated in the Official Journal of the European Union.

KEMA Quality B.V.

C.G. van Es
Certification Manager

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(13) **SCHEDULE**

(14) **to EC-Type Examination Certificate KEMA 04ATEX1066**

Issue No. 3

(15) **Description**

The Vibration Sensors Model AC90.-.....-, AC91.-.....-, LP80.-.....-, LP81.-.....-, LP90.-.....- and LP91.-.....- are used for acceleration measurement. The piezoelectric sensor converts mechanical forces (e.g. vibrations) of the equipment to which it is mounted into an electrical signal, depending on the version, either a voltage or a current signal. The apparatus is provided with a fixed cable or with a connector for the electrical connections.

AC90. Series - ambient temperature range -54 °C to +125 °C, T3, resp. T 150 °C;
AC91. Series - ambient temperature range -40 °C to +80 °C, T4, resp. T105 °C, or
ambient temperature range -40 °C to +125 °C, T3, resp. T150 °C;
LP8.. and LP9.. Series - ambient temperature range -40°C to +80°C, T4 resp. T105 °C

Electrical data

Models AC90.-.....-, LP80.-.....- and LP90.-.....-:

Supply and output circuit in type of protection Ex ia IIC, only for connection to a certified intrinsically safe circuit with the following maximum values:

$U_i = 28 \text{ V}$, $I_i = 100 \text{ mA}$, $P_i = 1 \text{ W}$, $C_i = 70 \text{ nF}$, $L_i = 51 \text{ } \mu\text{H}$.

Models AC91.-.....-, LP81.-.....- and LP91.-.....-:

Supply and output circuit in type of protection Ex ia IIC, only for connection to a certified intrinsically safe circuit with the following maximum values:

$U_i = 28 \text{ V}$, $I_i = 100 \text{ mA}$, $P_i = 1 \text{ W}$, $C_i = 0 \text{ nF}$, $L_i = 0 \text{ } \mu\text{H}$ (models without integral cable);

$U_i = 28 \text{ V}$, $I_i = 100 \text{ mA}$, $P_i = 1 \text{ W}$, $C_i = 80,4 \text{ nF}$, $L_i = 137,8 \text{ } \mu\text{H}$ (models with max. 500 m of integral cable).

Installation instructions

The Manual as provided with the equipment shall be followed in detailed to assure safe operation.

Routine tests

An Electric Strength Test of 500 Vac, during 1 minute, shall be applied between the input terminals and the equipment chassis.

(16) **Test Report**

KEMA No. 213329800.

(17) **Special conditions for safe use**

None.



(13) **SCHEDULE**

(14) **to EC-Type Examination Certificate KEMA 04ATEX1066**

Issue No. 3

(18) **Essential Health and Safety Requirements**

Assured by compliance with the standards listed at (9).

(19) **Test documentation**

As listed in Test Report No. 213329800.

(1) TYPE EXAMINATION CERTIFICATE

(2) **Equipment and protective systems intended for use in potentially explosive atmospheres - Directive 94/9/EC**

(3) Type Examination Certificate Number: **KEMA 10ATEX0084** Issue Number: **1**

(4) Equipment: **Vibration Sensors Model AC92....., AC93....., LP82....., LP83....., LP91..... and LP93.....**

(5) Manufacturer: **Connection Technology Center, Inc**

(6) Address: **7939 Rae Boulevard, Victor, New York, USA 14564**

(7) This equipment and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

(8) KEMA Quality B.V. certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the directive.

The examination and test results are recorded in confidential test report no. 213329800.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

**EN 60079-0 : 2006
EN 61241-1 : 2006**

EN 60079-15 : 2005

EN 61241-0 : 2006

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This Type Examination Certificate relates only to the design, examination and tests of the specified equipment and not to the manufacturing process and supply of this equipment.

(12) The marking of the equipment shall include the following:



II 3 G D

Ex nA IIC T3 or T4

Ex tD A22 IP6X T150 °C or T105 °C

This certificate is issued on March 24, 2010 and, as far as applicable, shall be revised before the date of cessation of presumption of conformity of (one of) the standards mentioned above as communicated in the Official Journal of the European Union.

KEMA Quality B.V.

C.G. van Es
Certification Manager

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(13) **SCHEDULE**

(14) **to Type Examination Certificate KEMA 10ATEX0084**

Issue No. 1

(15) **Description**

The Vibration Sensors Model AC92.-....., AC93.-....., LP82.-....., LP83.-....., LP92.-..... and LP93.-..... are used for acceleration measurement. The piezoelectric sensor converts mechanical forces (e.g. vibrations) of the equipment to which it is mounted into an electrical signal, depending on the version, either a voltage or a current signal. The apparatus is provided with a fixed cable or with a connector for the electrical connections.

AC92. Series - ambient temperature range -54 °C to +125 °C, T3, resp. T150 °C;

AC93. Series - ambient temperature range -40 °C to +80 °C, T4, resp. T105 °C or

ambient temperature range -40 °C to +125 °C, T3 resp. T150 °C;

LP8.. and LP9.. Series - ambient temperature range -40°C to +80°C, T4 resp. T105 °C

Electrical data

Models AC92.-....., AC93.-....., LP82.-....., LP83.-....., LP92.-..... and LP93.-.....:

Supply and output circuit:

$U_{max} = 28 \text{ V}$, $I_{max} = 100 \text{ mA}$.

Installation instructions

The Manual as provided with the equipment shall be followed in detailed to assure safe operation.

Routine tests

An Electric Strength Test of 500 Vac, during 1 minute, shall be applied between the input terminals and the equipment chassis.

(16) **Test Report**

KEMA No. 213329800.

(17) **Special conditions for safe use**

None.

(18) **Essential Health and Safety Requirements**

Covered by the standards listed at (9).

(19) **Test documentation**

As listed in Test Report No. 213329800.

Test Report No. 213329800

**Vibration Sensors Model AC90.-.....-, AC91.-.....-, AC92.-.....-,
AC93.-.....-, LP8.-.....- and LP9.-.....-**

Laboratory: **KEMA Quality B.V.**
Utrechtseweg 310
6812 AR Arnhem
The Netherlands

By order of: **Connection Technology Center, Inc**
7939 Rae Boulevard
Victor, New York
USA 14564

Author : Wesley Van Hill 2010-02-22 Reviewer : Andrew Redeker 2010-02-23
KEMA project no. : 213329800

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KEMA Quality B.V. and/or its associated companies disclaim liability for any direct, indirect, consequential or incidental damages that may result from the use of the information or data, or from the inability to use the information or data.

This Test Report contains the test results related to the sample(s) tested. The tests results cannot be used for any statement related to the quality of the equipment from running production.

1 KEMA project no. 2036994:

1.1 Standards applied

Information not available. All standards updated in KEMA Project 2095582 and 213329800.

1.2 Description of the equipment

Information not available, All descriptions and ratings being updated in KEMA Project 213329800

1.3 Marking of the equipment

Information not available. All markings updated in KEMA Project 2095582 and 213329800.

1.4 Test documentation

Information not available. All drawings updated in KEMA Project 2095582 and 213329800.

2 KEMA project no. 2095582:

2.1 Standards applied

Original Ex ia Certificate used EN 50014, EN 50020 and EN 50284

Updated Ex ia checklist to EN 60079-0 : 2004

Additional Standards for Ex nA: EN60079-0 : 2004 and EN60079-15 : 2005

The assessment was conducted from July 27, 2006 to April 23, 2007

2.2 Description of changes

The following changes have been assessed:

Update to Exia Certificate

- Correction and clarification of ambient temperature range and temperature code
- Update of schematic and bill of materials for LP8... and LP9... series of sensors
- Updated list of descriptive documents to include Bills of Materials for all models of sensors
- Addition of Type of Protection Ex nA

2.3 Marking of the equipment

For sensors using type of protection Ex ia:

C T C
590 Fisher Station Drive
Victor, NY 14564
⊕ Ex II 1 G Ex ia IIC

INTRINSICALLY SAFE
OPERATING TEMP CODE: T3
AMBIENT TEMP RANGE = $-54\text{ °C} \leq T_a \leq +125\text{ °C}$
OPERATING TEMP CODE: T4
AMBIENT TEMP RANGE = $-40\text{ °C} \leq T_a \leq +80\text{ °C}$
CONTROL DRAWING INS10012
Ex ia IIC T3 $-54\text{ °C} \leq T_a \leq +125\text{ °C}$
Ex ia IIC T4 $-40\text{ °C} \leq T_a \leq +80\text{ °C}$
U_i = 28 VDC
I_i = 100mA
C_i = 70nF, L_i = 51 μH
KEMA 04ATEX1066
2007 (yr of mfr)

For sensors using type of protection Ex nA:

C T C
590 Fisher Station Drive
Victor, NY 14564
⊕ Ex II 3 G Ex nA IIC

Ex nA
OPERATING TEMP CODE: T3
AMBIENT TEMP RANGE = $-54\text{ °C} \leq T_a \leq +125\text{ °C}$
OPERATING TEMP CODE: T4
AMBIENT TEMP RANGE = $-40\text{ °C} \leq T_a \leq +80\text{ °C}$
CONTROL DRAWING INS10035
U_{max} = 28 Vdc, I_{max} = 100mA
KEMA 10ATEX0084
2007 (yr of mfr)

2.4 Test documentation

| Document No. | Document Title | Issue | Date (yyyy/mm/dd) |
|--------------|--|-------|-------------------|
| INS10012 | Intrinsically Safe Sensor Control Drawing | A | 2007/03/21 |
| INS10013 | Sensors, 2 Pin Connector Intrinsically Safe Models | A | 2003/09/16 |
| INS10014 | Sensors, Accelerometers, Integral Cables, Intrinsically Safe Models | - | 2003/12/30 |
| INS10014 | Sensors, Loop Power, Integral Cables, Intrinsically Safe Models | - | 2003/12/30 |
| INS10014 | Sensors, Integral Cables, Intrinsically Safe Models | - | 2003/12/30 |
| INS10015 | Labelling, Intrinsically Safe Sensor, Location | - | 2003/07/17 |
| INS10017 | AC Series Labelling Matrix | B | 2004/02/17 |
| INS10018 | LP Series Labelling Matrix | B | 2004/02/17 |
| INS10019 | Traces, AC Series – 10mV/g, 50mV/g, 100 mV/g | - | 2003/07/17 |
| INS10020 | Component Layout, AC Series – 10mV/g, 50mV/g, 100 mV/g | - | 2003/07/17 |
| INS10021 | Traces Locations, LP Series, Side 1 & Side 2 | A | 2003/09/23 |
| INS10022 | Parts Locations, LP Series, Side 1 & Side 2 | A | 2003/09/23 |
| INS10025 | Marking / Labelling, Intrinsically Safe Sensor | - | 2004/01/30 |
| INS10026 | 4-20mA Output LP Sensor (Schematic) | B | 2006/08/15 |
| - | Bill of Materials – 4-20mA Output | B | 2006/08/16 |
| INS10027 | 100mV/g Intrinsically Safe (Schematic) | - | 2004/01/30 |
| - | Bill of Materials – 100mV/g Intrinsically Safe PC Board P/N ACP32090 | A | 2006/05/22 |
| INS10028 | 50mV/g Intrinsically Safe (Schematic) | - | 2004/01/30 |
| - | Bill of Materials – 50mV/g Intrinsically Safe PC Board P/N ACP32091 | A | 2006/05/22 |
| INS10029 | 10mV/g Intrinsically Safe (Schematic) | - | 2004/01/30 |
| - | Bill of Materials – 10mV/g Intrinsically Safe PC Board P/N ACP32092 | A | 2006/05/30 |
| INS10030 | Ceramic, Piezoelectric | - | 2003/12/23 |
| INS10031 | Sensing Element, Accelerometers, Intrinsically Safe Models | - | 2003/12/30 |

| | | | |
|----------|---|---|------------|
| INS10031 | Sensing Element, Loop Power, Intrinsically Safe Models | - | 2003/12/30 |
| MNX10014 | Installation, Operation & Maintenance Manual – Intrinsically Safe Sensors | A | 2007/04/27 |
| INS10035 | Class I, Div2 / Zone 2 Sensor Control Drawings | A | 2007/03/26 |
| INS10038 | AC Series Labelling Matrix for Division 2 | - | 2007/03/14 |
| INS10039 | LP Series Labelling Matrix for Division 2 | - | 2007/03/14 |
| MNX10021 | Installation, Operation & Maintenance Manual – Class I, Zone 2 sensors | - | 2007/04/27 |

3 KEMA project no. 213329800:

3.1 Standards applied

Unchanged:

EN60079-0 : 2006
EN60079-15 : 2005

Updated:

EN50020 : 2002 to EN60079-11:2007
EN50284 : 1999 to EN60079-26 : 2007

Added:

EN 61241-0 : 2006
EN 61241-1 : 2005
EN 61241-11 : 2007

The assessment was conducted from December 30, 2008 to February 22, 2010.

3.2 Description of changes

The following changes have been assessed:

- Addition of new models as follows:
Protection type Ex ia IIC T3/T4; Ex iaD 20 150°C (T-Code = T3) or T105 °C (T-Code = T4)
Transducer Sensor - AC90* Series - Temperature code T3; ambient temperature range -54 °C to +125 °C;
Transducer Sensor - LP8** and LP9** Series – Temperature Code T4; ambient temperature range -40 °C to +80 °C
Intrinsically safe with Entity Parameters:
Ui = 28VDC, Ii = 100mA, Pi = 1W, Ci = 70nF, Li = 51µH

Transducer Sensor - AC91* Series - Ambient Temperature Range -40°C to +80°C
(Temperature Code T4) or -40°C to +125°C (Temperature Code T3)

Intrinsically safe with Entity Parameters:

Ui = 28 VDC, Ii = 100 mA, Pi = 1 W, Ci = 0 nF, Li = 0µH (when not provided with integral cable)

Intrinsically safe with Entity Parameters:

Ui = 28 VDC, Ii = 100 mA, Pi = 1 W, Ci = 80.4 nF, Li = 137.76 µH (when provided with a maximum of 1640 feet (500m) of integral cable).

- Protection type Ex nA IIC T3/T4, Ex tD A22, IP6X T150°C (T-Code =T3) or T105°C (T-Code = T4)
Transducer Sensor - AC92* Series - Temperature code T3; ambient temperature range -54 °C to +125 °C
Transducer Sensor - LP8** and LP9** Series – Temperature Code T4; ambient temperature range -40 °C to +80 °C
Transducer Sensor - AC93* Series - Ambient Temperature Range -40 °C to +80 °C (Temperature Code T4) or -40°C to +125°C (Temperature Code T3)
- Completed Model Code listings can be found in the following manufacturer drawings
INS10017, INS10018, INS10038, INS10039
- For complete evaluation and details refer to Annex 3
- Addition of Dust protection types for the models as listed above
For complete evaluation and details refer to Annex 3
- Update of EN 50020 to EN 60079-11
Update was deemed acceptable based on the evaluation performed in IECExTR CA/CSA/10/TR221421-2126074 (1813811)
No further testing or evaluation was deemed necessary
- Update of EN50284 to EN60079-26
As the Zone 0 protection method of the equipment has not changed, the equipment was deemed to meet the requirements of EN60079-26 with no further evaluation being necessary

3.3 Marking of the equipment

Class 1 Div 1 (Zone 0) Labeling - (AC90*/LP80*/LP90*)

INTRINSICALLY SAFE
SECURITE INTRINSEQUE
Ex ia IIC T3 / T4
Ex iaD A20 T150oC (T-Code = T3) / T105oC (T-Code = T4)
DIP A20 IP6X T150oC (T-Code = T3) / T105oC (T-Code = T4)
AEx ia IIC T3 / T4
AEx iaD 20 T150oC (T-Code = T3) / T105oC (T-Code = T4)
CLI GPS A,B,C,D
CLII, GPS E,F,G, CLIII
CLI, ZONE 0, ZONE 20
OPERATING TEMP CODE: T3

AMBIENT TEMP RANGE = -54oC TO +125oC
OPERATING TEMP CODE: T4
AMBIENT TEMP RANGE = -40oC TO +80oC
CONTROL DRAWING INS10012
Ex ia IIC T3 -54oC < Ta < +125 oC
Ex ia IIC T4 -40oC < Ta < +80oC
Ui=28VDC li=100mA
Ci=70nF Li=51uH Pi=1W
CSA 221421
KEMA 04ATEX1066

AC90* Series – Temperature Code: T3
Ambient Temperature range = -54oC to +125oC

LP80*, and LP90* Series – Temperature Code: T4
Ambient temperature range = - 40oC to +80oC

Class 1 Div 1 (Zone 0) Labeling Low Capacitance - (AC91*/LP81*/LP91*)

INTRINSICALLY SAFE
SECURITE INTRINSEQUE
Ex ia IIC T3 / T4
Ex iaD A20 T150oC (T-Code = T3) or T105oC (T-Code = T4)
DIP A20 IP6X T150oC (T-Code = T3) or T105oC (T-Code = T4)
AEx ia IIC T3 / T4
AEx iaD 20 T150oC (T-Code = T3) or T105oC (T-Code = T4)
CLI GPS A,B,C,D
CLII, GPS E,F,G, CLIII
CLI, ZONE 0, ZONE 20
OPERATING TEMP CODE: T3
AMBIENT TEMP RANGE = -40oC TO +125oC
OPERATING TEMP CODE: T4
AMBIENT TEMP RANGE = -40oC TO +80oC
CONTROL DRAWING INS10012
Ex ia IIC T3 -40 oC < Ta < +125 oC
Ex ia IIC T4 -40oC < Ta < +80oC
Ui=28VDC li=100mA
Ci=0nF Li=0uH Pi=1W
CSA 221421
KEMA 04ATEX1066

AC91* Series – Temperature Code: T3
Ambient Temperature range = -40oC to +125oC

AC91*, LP81*, and LP91* Series – Temperature Code: T4
Ambient temperature range = - 40oC to +80oC

Class I Div 2 (Zone 2) Labeling (AC92*/LP82*/LP92*)

Ex nA IIC T3 / T4
Ex tD A22 IP6X T150oC (T-Code=T3) / T105oC (T-Code=T4)
DIP A22 IP6X T150oC (T-Code=T3) / T105oC (T-Code=T4)
AEx nA IIC T3 / T4, CLI, Zone 2
AEx tD 22 IP6X T150oC (T-Code=T3) / T105oC (T-Code=T4)
CLI Div 2, GPS A,B,C,D
CLII Div 2, GPS F,G, CLIII
OPERATING TEMP CODE: T3
AMBIENT TEMP RANGE = -54oC TO +125oC
OPERATING TEMP CODE: T4
AMBIENT TEMP RANGE = -40oC TO +80oC
CONTROL DRAWING INS10035
Vmax=28 VDC Imax=100 mA
CSA 221421
(yr of mfr)
AC92* Series – Temperature code: T3
Ambient temperature range = -54 °C to +125 °C
LP82* and LP92* Series – Temperature code: T4
Ambient temperature range = -40 °C to +80 °C

Class I Div 2 (Zone 2) Labeling Low Capacitance (AC93*/LP83*/LP93*)

Ex nA IIC T3 / T4
Ex tD A22 IP6X T150oC (T-Code=T3) or T105oC (T-Code=T4)
DIP A22 IP6X T150oC (T-Code=T3) or T105oC (T-Code=T4)
AEx nA IIC T3 / T4, CLI, Zone 2
AEx tD 22 IP6X T150oC (T-Code=T3) / T105oC=T4)
CLI Div 2, GPS A,B,C,D
CLII Div 2, GPS F,G, CLIII
OPERATING TEMP CODE: T3
AMBIENT TEMP RANGE = -40oC TO +125oC
OPERATING TEMP CODE: T4
AMBIENT TEMP RANGE = -40oC TO +80oC
CONTROL DRAWING INS10035
Vmax=28 VDC Imax=100 mA
CSA 221421
(yr of mfr)
AC93* Series – Temperature code: T3
Ambient temperature range = -40oC to +125oC
AC93*, LP83* and LP93* Series – Temperature code: T4
Ambient temperature range = -40oC to +80oC

3.4 Test documentation

| Document No. | Document Title | Issue | Date |
|--------------|--|-------|------------|
| INS10012 | Intrinsically Safe Sensor Control Drawing | B | 2009/12/21 |
| INS10013 | Sensors, 2 Pin Connector Hazardous Area | B | 2009/11/25 |
| INS10014 | Sensors, Accelerometers, With Integral Cables, Hazardous Areas | A | 2009/11/25 |
| INS10015 | Labeling, Intrinsically Safe Sensor, Location | A | 2007/05/09 |
| INS10017 | AC Series Labeling Matrix | D | 2009/12/10 |
| INS10018 | LP Series Labeling Matrix | D | 2009/12/09 |
| INS10019 | Traces, AC Series – 10mV/g, 50mV/g, 100 mV/g | - | 2003/07/17 |
| INS10020 | Component Layout, AC Series – 10mV/g, 50mV/g, 100 mV/g | - | 2003/07/17 |
| INS10021 | Traces Locations, LP Series, Side 1 & Side 2 | A | 2003/09/23 |
| INS10022 | Parts Locations, LP Series, Side 1 & Side 2 | A | 2003/09/23 |
| INS10025 | Marking / Labeling, Intrinsically Safe Sensor | B | 2009/12/21 |
| INS10026 | 4-20mA Output LP Sensor (Schematic) | B | 2006/08/15 |
| - | Bill of Materials – 4-20mA Output P/N ACP32093 | B | 2006/08/16 |
| INS10027 | 100mV/g Intrinsically Safe (Schematic) | - | 2004/01/30 |
| - | Bill of Materials – 100mV/g Intrinsically Safe PC Board P/N ACP32090 | A | 2006/05/22 |
| INS10028 | 50mV/g Intrinsically Safe (Schematic) | - | 2004/01/30 |
| - | Bill of Materials – 50mV/g Intrinsically Safe PC Board P/N ACP32091 | A | 2006/05/22 |
| INS10029 | 10mV/g Intrinsically Safe (Schematic) | - | 2004/01/30 |
| - | Bill of Materials – 10mV/g Intrinsically Safe PC Board P/N ACP32092 | A | 2006/05/30 |
| INS10030 | Ceramic, Piezoelectric | - | 2003/12/23 |
| INS10031 | Sensing Element, Accelerometers, Intrinsically Safe Models | A | 2009/11/25 |
| INS10038 | AC Series Labeling Matrix for Class I, Division 2 | B | 2009/12/10 |
| INS10039 | LP Series Labeling Matrix for Class I, Division 2 | C | 2009/12/09 |
| INS10053 | AC91* and AC93* - Schematic - Intrinsically Safe Accelerometer (100, 50 & 10mV/g) | C | 2010/01/22 |
| - | Bill of Materials - INS10053 - Intrinsically Safe Accelerometer (100, 50 & 10mV/g) | C | 2010/01/22 |
| - | Trace and Component Layouts for INS10053 | C | - |
| INS10035 | C1D2 Sensor Control Drawing | B | 2009/12/17 |
| CBP10032 | Cable, Red, Teflon Jacketed, twisted, shielded pair | E | 2009/12/16 |
| CBP10033 | Cable, Black, Polyurethane Jacketed, Twisted, Shielded Pair | F | 2009/12/16 |
| CBP10039 | Cable, Red, Teflon Jacketed, Twisted, Shielded Pair | B | 2009/12/16 |
| CBP10099 | Cable, Yellow Jacketed, 0.190 Diameter | E | 2009/12/16 |
| CBP10202 | Cable, Blue (Ral5015 Equiv), Polyurethane Jacketed, Twisted, Shielded Pair | C | 2009/12/16 |
| CBP10283 | Blue Thermoplastic Cable, 2 Conductor (Class I, Division 2) | E | 2009/12/16 |
| MX10014 | Product Manual - Models AC90X, AC91X, LP80X, LP81X, LP90X, LP91X - Intrinsically Safe | C | 2010/01/11 |
| MX10021 | Product Manual - MODELS AC92X, AC93X, LP82X, LP83X, LP92X, LP93X - Class 1 Division 2 / Zone 2 - Vibration Sensors | C | 2010/02/03 |

4 Instructions for installation and use

The manual provided with the equipment shall be followed in detail to assure safe operation.

5 Test results

The detailed test results are laid down in confidential files no. 203699400, 209558200 and 213329800. A summary is given in the Annexes to this report. There were no deviations from, additions to or exclusions from the applicable test methods as described in the standards mentioned under 1.1, 2.1 and 3.1. Where applicable, the estimated uncertainty of measurement meets the requirements of IECEx Operational Document OD012.

6 Conclusion

The equipment as described under 1.2, 2.2 and 3.2 meet all applicable requirements of the standards as mentioned under 1.1, 2.1 and 3.1. Continued certification of the equipment is therefore recommended.

Author:

Reviewer:

Signed:

Signed:

Wesley Van Hill
(CSA International)

Andrew Redeker
(CSA International)

Endorsed on March 24, 2010 by:



C.G. van Es
Certification Manager

Annex A.1. Summary of test results KEMA project no. 2036994:

No information available

Annex A.2. Summary of test results KEMA project no. 2095582:

UPDATE TO EXIA CERTIFICATE

1. **Correction and clarification of ambient temperature range and temperature code**
 - a. AC9xx-xxxxx-x series
 - i. Temperature Code = T3
 - ii. Ambient Temperature Range = $-54^{\circ}\text{C} \leq T_a \leq +125^{\circ}\text{C}$
 - b. LP8xx-xx-xxx and LP9xx-xx-xxx series
 - i. Temperature Code = T4
 - ii. Ambient Temperature Range = $-40^{\circ}\text{C} \leq T_a \leq +80^{\circ}\text{C}$

The original certificate was not clear on the ambient temperature ranges and temperature codes for the individual sensor models.

The LP8xx-xx-xxx and LP9xx-xx-xxx series of sensors have a temperature code of T4 based on the following:

- Previously performed temperature testing
- A wiring temperature assessment with the following findings
 - o The diameter of the internal wiring is 0.2019mm and the current present (100mA) is within the limit of Table 1 of IEC 60079-11:1999.
- A Printed circuit board assessment with the following findings:
 - o Based on table 2 of IEC 60079-11:1999, using a minimum track width of 0.15mm, the maximum permissible current is 1.2A. The following divisors need to be taken into account:
 - Note 3 – For boards with a thickness between 0.5mm and 1.6mm, divide the maximum current specified by 1.2
 - Note 4 – For boards with conducting tracks on both sides, divide the maximum current specified by 1.5

Based on these divisors the maximum allowable current within the subject circuits is 667mA. The maximum rated current for the sensors is equal to 100mA, therefore the specified temperature codes were deemed acceptable.

The AC9xx-xxxxx-x series of sensors have a temperature code of T3 based on the following testing:

Printed Circuit Board Temperature Test

Equipment Tested AC9XX Series Sensor
Date of Test January 24, 2007
Standards IEC 60079-11, Edition 4 Clause 10.5

Test Procedure

100 mA was passed through the smallest trace.
Temperature measurements were done by thermocouple.

Results

| | Measured Temperature (°C) |
|---------|---------------------------|
| Trace | 125.9°C |
| Ambient | 124.6°C |

Temperature Testing Under Fault Conditions

Equipment Tested AC9XX Series Sensor
Date of Test February 7, 2007
Standards IEC 60079-11, Edition 4 Clause 10.5

Test Procedure

The AC9xx (100mV) circuit was powered using an input power supply set to 28VDC. A current limiting resistor of 280Ω was placed in series to simulate the maximum input power available through the barrier.

The test was performed by shorting pins 1 and 2 of component D1, removing component T1 and cutting the trace to isolate the following components from the circuit; R6, Q1, Q2 and D1. A thermocouple was affixed to component Q2 for the test.

Results

The maximum recorded temperature on component Q2 was 200°C. This is acceptable for the requested T-Code of T3 when considering that the component size is less than 10cm³.

Internal Wiring Temperature Tests

Equipment Tested AC9XX Series Sensor
Date of Test January 29, 2007
Standards IEC 60079-11, Edition 4 Clause 10.5

Test Procedure

105 mA was passed through a section of interior wire. Temperature measurements were done by thermocouple.

Results

| TC No. | 6.1.1.1.1 | Thermocouple Location | Temperature (°C) |
|------------|---|-----------------------|------------------|
| 1 | | Interior wire | 125.7 |
| | | Ambient | 125.2 |
| Comments: | 105 mA was passed through a section of interior wire. | | |
| Compliance | YES | | |

2. Update of schematic and bill of materials for LP8xx-xx-xxx and LP9xx-xx-xxx series of sensors

- a. Increase value of C9 from 33nF to 1µF. Relevant drawings replaced to reflect changes (INS10026 and related bill of materials)

These changes were deemed to not affect the safety of the sensors as this series is encapsulated and all inductance and capacitance is prevented from leaving the encapsulation through the use of components D3, D4, and D5

D3, D4 and D5 are rated 75V, 200mW with a minimum of 0.7 mm creepage across and adjacent.

Manufacturers: Diodes Incorporated, Vishay, WTE Power Semiconductor or Rectron Semiconductor

Part Number: 1N4148WS

3. Updated list of descriptive documents to include Bills of Materials for all models of sensor

The following list contains the entire document package for the intrinsically safe sensors

| Document No. | Document Title | Issue | Date (yyyy/mm/dd) |
|--------------|---|-------|----------------------|
| INS10012 | Intrinsically Safe Sensor Control Drawing | - | 2004/01/30 |
| INS10013 | Sensors, 2 Pin Connector Intrinsically Safe Models | A | 2003/09/16 |
| INS10014 | Sensors, Accelerometers, Integral Cables, Intrinsically Safe Models | - | 2003/12/30 |
| INS10014 | Sensors, Loop Power, Integral Cables, Intrinsically Safe Models | - | 2003/12/30 |
| INS10014 | Sensors, Integral Cables, Intrinsically Safe Models | - | 2003/12/30 |
| INS10015 | Labelling, Intrinsically Safe Sensor, Location | - | 2003/07/17 |
| INS10017 | AC Series Labelling Matrix | B | 2004/02/17 |
| INS10018 | LP Series Labelling Matrix | B | 2004/02/17 |
| INS10019 | Traces, AC Series – 10mV/g, 50mV/g, 100 mV/g | - | 2003/07/17 |
| INS10020 | Component Layout, AC Series – 10mV/g, 50mV/g, 100 mV/g | - | 2003/07/17 |
| INS10021 | Traces Locations, LP Series, Side 1 & Side 2 | A | 2003/09/23 |
| INS10022 | Parts Locations, LP Series, Side 1 & Side 2 | A | 2003/09/23 |
| INS10025 | Marking / Labelling, Intrinsically Safe Sensor | - | 2004/01/30 |
| INS10026 | 4-20mA Output LP Sensor (Schematic) | - | 2006/08/15 |
| - | Bill of Materials – 4-20mA Output | - | 2006/08/16 |
| INS10027 | 100mV/g Intrinsically Safe (Schematic) | - | 2004/01/30 |
| - | Bill of Materials – 100mV/g Intrinsically Safe PC Board P/N ACP32090 | A | 2006/05/22 |
| INS10028 | 50mV/g Intrinsically Safe (Schematic) | - | 2004/01/30 |
| - | Bill of Materials – 50mV/g Intrinsically Safe PC Board P/N ACP32091 | A | 2006/05/22 |
| INS10029 | 10mV/g Intrinsically Safe (Schematic) | - | 2004/01/30 |
| - | Bill of Materials – 10mV/g Intrinsically Safe PC Board P/N ACP32092 | A | 2006/05/30 |
| INS10030 | Ceramic, Piezoelectric | - | 2003/12/23 |
| INS10031 | Sensing Element, Accelerometers, Intrinsically Safe Models | - | 2003/12/30 |
| INS10031 | Sensing Element, Loop Power, Intrinsically Safe Models | - | 2003/12/30 |
| MNX10014 | Installation, Operation & Maintenance Manual – Intrinsically Safe Sensors | A | 2007/04/27 |

II ADDITION OF TYPE OF PROTECTION EX nA

Purpose: To allow for the installation of the subject sensors in a Class I, Zone 2 classified area without the use of a barrier.

Scope: The scope of this portion of the project only concerns the protection of the actual sensors. It does not include the installation of the sensors.

The installation is to be in accordance with the applicable installation code (IEC 60079-14). The suitability of the installation is to be determined by the authority having local jurisdiction

Evaluation for Type of Protection Ex nA

The Ex nA sensor models are constructed identically to the previously evaluated intrinsically safe models.

Testing performed as part of the IS evaluation was deemed applicable and representative for this portion of the evaluation. A temperature test under normal operation was deemed necessary with the results as follows

| | |
|------------------|--|
| Equipment Tested | AC9XX Series Sensor |
| Date of Test | January 24, 2007 |
| Standards | IEC 60079-0, Edition 3.1 Clause 5.1 and Clause 5.2 |

Test Procedure

A regulated dc power supply of 28V, 100mA connected to the accelerometer pcb.

Temperature measurements were done by thermocouple. Testing was performed on an unencapsulated model.

Results

| TC No. | Thermocouple Location | Temperature (°C) | |
|--------|-----------------------|------------------|-------|
| | | 28 Vdc | 72 mA |
| 1 | Q1 | | 138.7 |
| 2 | Q2 | | 160.8 |
| 3 | Z1 | | 153.7 |
| 4 | T1 | | 134.6 |
| 5 | Ambient | | 125.0 |

Comments: Input : (at the end of test) 28 Vdc 72 mA
Sample board was tested with a 280 ohm resistor in series

Sample 8500 1 of 3

Attached are the relevant checklists completed in accordance with EN60079-0: 2004 with Corrigendum (April 2004) and IEC60079-15: 2005 - Third Edition

Additional Manufacturer's Drawings for Zone 2 Amendment

| Document No. | Document Title | Issue | Date (yyyy/mm/dd) |
|--------------|--|-------|-------------------|
| INS10035 | Class I, Div2 / Zone 2 Sensor Control Drawings | A | 2007/03/26 |
| INS10038 | AC Series Labelling Matrix for Division 2 | - | 2007/03/14 |
| INS10039 | LP Series Labelling Matrix for Division 2 | - | 2007/03/14 |
| MNX10021 | Installation, Operation & Maintenance Manual – Class I, Zone 2 sensors | - | 2007/04/27 |

Annex A.3. Summary of test results KEMA project no. 213329800:

INTRINSICALLY SAFE EVALUATION

Refer to IECEx TR CA/CSA/10/221421/2126074 (1813811) for details on the Intrinsically Safe model evaluation. Model number changes are as follows:

AC90x = AC95x

AC91x = AC96x

NON-INCENDIVE EVALUATION

Previously performed testing and evaluation were deemed applicable to the new models added to this report. Equipment was evaluated and deemed to meet the requirements of protection type Ex nA with no additional testing being necessary. Checklists for EN60079-0 and EN60079-15 have been updated to reflect the new and additional model numbers

DUST EVALUATION

New checklists completed to show compliance of the equipment with the following standards:

- EN61241-0:2006 - Electrical Apparatus for Use in the Presence of Combustible Dust – Part 0: General Requirements
- EN61241-1:2005 - Electrical apparatus for use in the presence of combustible dust Part 1: protection by enclosures "tD"

- EN61241-11:2007 - Electrical apparatus for use in the presence of combustible dust –Part 11: Protection by intrinsic safety 'iD'

Detailed test results can be found in IECEx TR CA/CSA/10/221421/2126074 (1813811) where the testing was performed on the enclosures in accordance with IEC61241-1-1.

Testing was deemed equivalent to testing required by EN61241-1.

No testing was deemed required to determine acceptability of the equipment for type of protection Ex iaD as the sensors have been evaluated as being Ex ia per EN60079-11

The following drawings were updated from the Manufacturer's drawing list as part of this project:

| Document No. | Document Title | Issue | Date |
|--------------|--|-------|------------|
| INS10012 | Intrinsically Safe Sensor Control Drawing | B | 2009/12/21 |
| INS10013 | Sensors, 2 Pin Connector Hazardous Area | B | 2009/11/25 |
| INS10014 | Sensors, Accelerometers, With Integral Cables, Hazardous Areas | A | 2009/11/25 |
| INS10015 | Labeling, Intrinsically Safe Sensor, Location | A | 2007/05/09 |
| INS10017 | AC Series Labeling Matrix | D | 2009/12/10 |
| INS10018 | LP Series Labeling Matrix | D | 2009/12/09 |
| INS10025 | Marking / Labeling, Intrinsically Safe Sensor | B | 2009/12/21 |
| INS10026 | 4-20mA Output LP Sensor (Schematic) | B | 2006/08/15 |
| - | Bill of Materials – 4-20mA Output P/N ACP32093 | B | 2006/08/16 |
| INS10031 | Sensing Element, Accelerometers, Intrinsically Safe Models | A | 2009/11/25 |
| INS10038 | AC Series Labeling Matrix for Class I, Division 2 | B | 2009/12/10 |
| INS10039 | LP Series Labeling Matrix for Class I, Division 2 | C | 2009/12/09 |

The following drawings were added to the Manufacturers Drawing list as part of this project:

| Document No. | Document Title | Issue | Date |
|--------------|--|-------|------------|
| INS10053 | AC91* and AC93* - Schematic - Intrinsically Safe Accelerometer (100, 50 & 10mV/g) | C | 2010/01/22 |
| - | Bill of Materials - INS10053 - Intrinsically Safe Accelerometer (100, 50 & 10mV/g) | C | 2010/01/22 |
| - | Trace and Component Layouts for INS10053 | C | - |
| INS10035 | C1D2 Sensor Control Drawing | B | 2009/12/17 |

| | | | |
|----------|--|---|------------|
| CBP10032 | Cable, Red, Teflon Jacketed, twisted, shielded pair | E | 2009/12/16 |
| CBP10033 | Cable, Black, Polyurethane Jacketed, Twisted, Shielded Pair | F | 2009/12/16 |
| CBP10039 | Cable, Red, Teflon Jacketed, Twisted, Shielded Pair | B | 2009/12/16 |
| CBP10099 | Cable, Yellow Jacketed, 0.190 Diameter | E | 2009/12/16 |
| CBP10202 | Cable, Blue (Ra15015 Equiv), Polyurethane Jacketed, Twisted, Shielded Pair | C | 2009/12/16 |
| CBP10283 | Blue Thermoplastic Cable, 2 Conductor (Class I, Division 2) | E | 2009/12/16 |
| MNX10014 | Product Manual - Models AC90X, AC91X, LP80X, LP81X, LP90X, LP91X - Intrinsically Safe | C | 2010/01/11 |
| MNX10021 | Product Manual - MODELS AC92X, AC93X, LP82X, LP83X, LP92X, LP93X - Class 1 Division 2 / Zone 2 - Vibration Sensors | C | 2010/02/03 |

END OF TEST REPORT