



FM Approvals  
 1151 Boston Providence Turnpike  
 P.O. Box 9102 Norwood, MA 02062 USA  
 T: 781 762 4300 F: 781-762-9375 www.fmapprovals.com

Member of the FM Global Group

# CERTIFICATE OF COMPLIANCE

## HAZARDOUS (CLASSIFIED) LOCATION ELECTRICAL EQUIPMENT

This certificate is issued for the following equipment:

### **Stratos® Pro Type A2abB-c-d. Analyzing Unit**

NI / I / 2 / ABCD / T4 Ta = 65 °C; Type 4X  
 S / II,III / 2 / FG / T4 Ta = 65 °C; Type 4X  
 I / 2 / Ex nA / IIC / T4, Ta = 65 °C; Type 4X  
 22 / Ex tD / T85 °C; Type 4X

where

a = Communications: 0, 1  
 b = Version: 1  
 c = Measuring Channel : MSPH , MSCOND, MSOXY, CC, PH, COND, CONDI, OXY, CO2  
 d = 2<sup>nd</sup> Current Output: 0, 1

### **Stratos® Pro Type A2abX-c-d. Analyzing Unit**

IS / I,II,III / 1 / ABCDEFG / T4 Ta = -20 °C to 65 °C; - 212.002 300 Entity\*; Type 4X  
 I / 0 / Ex ia IIC / T4 Ta = -20 °C to 65 °C; - 212.002 300 Entity\*; Type 4X  
 NI / I / 2 / ABCD / T4 Ta = 65 °C; Type 4X  
 S / II,III / 2 / FG / T4 Ta = 65 °C; Type 4X  
 I / 2 / Ex nA / IIC / T4, Ta = 65 °C; Type 4X  
 22 / Ex tD / T85 °C; Type 4X

where

a = Communications: 0, 1  
 b = Version: 1  
 c = Measuring Channel : MSPH , MSCOND, MSOXY, CC, PH, COND, CONDI, OXY, CO2  
 d = 2<sup>nd</sup> Current Output: 0, 1

### **MK interface / RS 485**

**Entity Parameters\*:** ST15 / Terminals KL1, 2, 3, 4  
**Output:** Uo (Voc) = 5 V, Io (Isc) = 124 mA, Po = 155 mW

|                                      |                   |                  |
|--------------------------------------|-------------------|------------------|
| Class I, Zone 0, Group IIC           | Co (Ca) = 83.2 µF | Lo (La) = 2 mH   |
| Class I, Division 1, Groups A & B    |                   |                  |
| Class I, Zone 0, Group IIB           | Co (Ca) = 1000 µF | Lo (La) = 8.5 mH |
| Class I, Division 1, Groups C & E    |                   |                  |
| Class I, Zone 0, Group IIA           | Co (Ca) = 1000 µF | Lo (La) = 16 mH  |
| Class I, Division 1, Group D, F, & G |                   |                  |



Member of the FM Global Group

**Current output 1 / HART Entity Parameters\*:** Terminals KL8, KL9, ST1, ST2  
Input:  $U_i$  ( $V_{max}$ ) = 30 V,  $i_i$  ( $I_{max}$ ) = 100 mA,  $P_i$  = 800 mW,  $C_i$  = 5.3 nF,  $L_i$  = 2.5  $\mu$ H

**Current output 2 Entity Parameters\*:** Terminals KL8 (KL16), KL17  
Input:  $U_i$  ( $V_{max}$ ) = 30 V,  $i_i$  ( $I_{max}$ ) = 100 mA,  $P_i$  = 800 mW,  $C_i$  = 5.3 nF,  $L_i$  = 2.5  $\mu$ H

**Current input Entity Parameters\*:** Terminals KL5, 6  
Input:  $U_i$  ( $V_{max}$ ) = 30 V,  $i_i$  ( $I_{max}$ ) = 100 mA,  $P_i$  = 800 mW,  $C_i$  = 12 nF,  $L_i$  = 0

**OK inputs HOLD, CONTROL Entity Parameters\*:** Terminals KL10, 11 and KL13, 14  
Input:  $U_i$  ( $V_{max}$ ) = 30 V,  $i_i$  ( $I_{max}$ ) = 100 mA,  $P_i$  = 1 W,  $C_i$  = 0,  $L_i$  = 0

*with MK-pH Module, Control Drawing 212.002 110*

**pH Measuring Loop**

Entity Parameters\*: Terminals A, B, C, K  
Output:  $U_o$  ( $V_{oc}$ ) = 15 V,  $i_o$  ( $I_{sc}$ ) = 19.9 mA,  $P_o$  = 49.8 mW

|                                      |                                |                          |
|--------------------------------------|--------------------------------|--------------------------|
| Class I, Zone 0, Group IIC           | $C_o$ ( $C_a$ ) = 553 nF       | $L_o$ ( $L_a$ ) = 90 mH  |
| Class I, Division 1, Groups A & B    |                                |                          |
| Class I, Zone 0, Group IIB           | $C_o$ ( $C_a$ ) = 3.52 $\mu$ F | $L_o$ ( $L_a$ ) = 320 mH |
| Class I, Division 1, Groups C & E    |                                |                          |
| Class I, Zone 0, Group IIA           | $C_o$ ( $C_a$ ) = 13.9 $\mu$ F | $L_o$ ( $L_a$ ) = 610 mH |
| Class I, Division 1, Group D, F, & G |                                |                          |

**Temperature Measuring Loop**

Entity Parameters\*: Terminals H, I  
Output:  $U_o$  ( $V_{oc}$ ) = 10 V,  $i_o$  ( $I_{sc}$ ) = 18.3 mA,  $P_o$  = 45.7 mW

|                                      |                                 |                          |
|--------------------------------------|---------------------------------|--------------------------|
| Class I, Zone 0, Group IIC           | $C_o$ ( $C_a$ ) = 2.87 $\mu$ F  | $L_o$ ( $L_a$ ) = 95 mH  |
| Class I, Division 1, Groups A & B    |                                 |                          |
| Class I, Zone 0, Group IIB           | $C_o$ ( $C_a$ ) = 19.87 $\mu$ F | $L_o$ ( $L_a$ ) = 350 mH |
| Class I, Division 1, Groups C & E    |                                 |                          |
| Class I, Zone 0, Group IIA           | $C_o$ ( $C_a$ ) = 99 $\mu$ F    | $L_o$ ( $L_a$ ) = 630 mH |
| Class I, Division 1, Group D, F, & G |                                 |                          |

**pH / Temperature Measuring Loop**

Entity Parameters\*: Terminals A, B, C, H, I, K  
Output:  $U_o$  ( $V_{oc}$ ) = 15 V,  $i_o$  ( $I_{sc}$ ) = 38.2 mA,  $P_o$  = 95.5 mW

|                                      |                                |                          |
|--------------------------------------|--------------------------------|--------------------------|
| Class I, Zone 0, Group IIC           | $C_o$ ( $C_a$ ) = 432 nF       | $L_o$ ( $L_a$ ) = 23 mH  |
| Class I, Division 1, Groups A & B    |                                |                          |
| Class I, Zone 0, Group IIB           | $C_o$ ( $C_a$ ) = 3.4 $\mu$ F  | $L_o$ ( $L_a$ ) = 90 mH  |
| Class I, Division 1, Groups C & E    |                                |                          |
| Class I, Zone 0, Group IIA           | $C_o$ ( $C_a$ ) = 13.8 $\mu$ F | $L_o$ ( $L_a$ ) = 180 mH |
| Class I, Division 1, Group D, F, & G |                                |                          |

**pH / ISM / Temperature Measuring Loop**

Entity Parameters\*: Terminals A, B, C, F, G, H, I, K  
Output:  $U_o$  ( $V_{oc}$ ) = 15 V,  $i_o$  ( $I_{sc}$ ) = 48.7 mA,  $P_o$  = 122 mW

|                                      |                                |                          |
|--------------------------------------|--------------------------------|--------------------------|
| Class I, Zone 0, Group IIC           | $C_o$ ( $C_a$ ) = 432 nF       | $L_o$ ( $L_a$ ) = 432 nF |
| Class I, Division 1, Groups A & B    |                                |                          |
| Class I, Zone 0, Group IIB           | $C_o$ ( $C_a$ ) = 3.4 $\mu$ F  | $L_o$ ( $L_a$ ) = 55 mH  |
| Class I, Division 1, Groups C & E    |                                |                          |
| Class I, Zone 0, Group IIA           | $C_o$ ( $C_a$ ) = 13.8 $\mu$ F | $L_o$ ( $L_a$ ) = 130 mH |
| Class I, Division 1, Group D, F, & G |                                |                          |



Member of the FM Global Group

### pH / Supply / Temperature Measuring Loop

Entity Parameters\*: Terminals A, B, C, D, E, H, I, K

Input: Output: Uo (Voc) = 15 V, Io (Isc) = 93.8 mA, Po = 200 mW

|                                      |                        |                 |
|--------------------------------------|------------------------|-----------------|
| Class I, Zone 0, Group IIC           | Co (Ca) = 379 nF       | Lo (La) = 4 mH  |
| Class I, Division 1, Groups A & B    |                        |                 |
| Class I, Zone 0, Group IIB           | Co (Ca) = 3.35 $\mu$ F | Lo (La) = 19 mH |
| Class I, Division 1, Groups C & E    |                        |                 |
| Class I, Zone 0, Group IIA           | Co (Ca) = 13.8 $\mu$ F | Lo (La) = 40 mH |
| Class I, Division 1, Group D, F, & G |                        |                 |

### pH / Supply / ISM / Temperature Measuring Loop

Entity Parameters\*: Terminals A, B, C, D, E, F, G, H, I, K

Output: Uo (Voc) = 15 V, Io (Isc) = 104.3 mA, Po = 200 mW

|                                      |                        |                 |
|--------------------------------------|------------------------|-----------------|
| Class I, Zone 0, Group IIC           | Co (Ca) = 379 nF       | Lo (La) = 3 mH  |
| Class I, Division 1, Groups A & B    |                        |                 |
| Class I, Zone 0, Group IIB           | Co (Ca) = 3.35 $\mu$ F | Lo (La) = 12 mH |
| Class I, Division 1, Groups C & E    |                        |                 |
| Class I, Zone 0, Group IIA           | Co (Ca) = 13.8 $\mu$ F | Lo (La) = 24 mH |
| Class I, Division 1, Group D, F, & G |                        |                 |

### ISM Measuring Loop

Entity Parameters\*: Terminals F, G

Output: Uo (Voc) = 15 V, Io (Isc) = 10.6 mA, Po = 26.6 mW

|                                      |                        |                   |
|--------------------------------------|------------------------|-------------------|
| Class I, Zone 0, Group IIC           | Co (Ca) = 580 nF       | Lo (La) = 300 mH  |
| Class I, Division 1, Groups A & B    |                        |                   |
| Class I, Zone 0, Group IIB           | Co (Ca) = 3.55 $\mu$ F | Lo (La) = 1000 mH |
| Class I, Division 1, Groups C & E    |                        |                   |
| Class I, Zone 0, Group IIA           | Co (Ca) = 14 $\mu$ F   | Lo (La) = 1000 mH |
| Class I, Division 1, Group D, F, & G |                        |                   |

with MK-OXY module, Control Drawing 212.002 120

### OXY Measuring Loop

Entity Parameters\*: Terminals A, B, C, D, I

Output: Uo (Voc) = 15 V, Io (Isc) = 8.2 mA, Po = 20.5 mW

|                                      |                        |                   |
|--------------------------------------|------------------------|-------------------|
| Class I, Zone 0, Group IIC           | Co (Ca) = 580 nF       | Lo (La) = 500 mH  |
| Class I, Division 1, Groups A & B    |                        |                   |
| Class I, Zone 0, Group IIB           | Co (Ca) = 3.55 $\mu$ F | Lo (La) = 1000 mH |
| Class I, Division 1, Groups C & E    |                        |                   |
| Class I, Zone 0, Group IIA           | Co (Ca) = 14 $\mu$ F   | Lo (La) = 1000 mH |
| Class I, Division 1, Group D, F, & G |                        |                   |

### Temperature Measuring Loop

Entity Parameters\*: Terminals G, H

Output: Uo (Voc) = 10 V, Io (Isc) = 1.6 mA, Po = 4 mW

|                                      |                        |                   |
|--------------------------------------|------------------------|-------------------|
| Class I, Zone 0, Group IIC           | Co (Ca) = 2.88 $\mu$ F | Lo (La) = 1000 mH |
| Class I, Division 1, Groups A & B    |                        |                   |
| Class I, Zone 0, Group IIB           | Co (Ca) = 19.8 $\mu$ F | Lo (La) = 1000 mH |
| Class I, Division 1, Groups C & E    |                        |                   |
| Class I, Zone 0, Group IIA           | Co (Ca) = 99 $\mu$ F   | Lo (La) = 1000 mH |
| Class I, Division 1, Group D, F, & G |                        |                   |

### OXY / Temperature Measuring Loop

Entity Parameters\*: Terminals A, B, C, D, G, H, I

Output: Uo (Voc) = 15 V, Io (Isc) = 9.7 mA, Po = 25 mW

|                                      |                        |                   |
|--------------------------------------|------------------------|-------------------|
| Class I, Zone 0, Group IIC           | Co (Ca) = 481 nF       | Lo (La) = 300 mH  |
| Class I, Division 1, Groups A & B    |                        |                   |
| Class I, Zone 0, Group IIB           | Co (Ca) = 3.46 $\mu$ F | Lo (La) = 1000 mH |
| Class I, Division 1, Groups C & E    |                        |                   |
| Class I, Zone 0, Group IIA           | Co (Ca) = 13.9 $\mu$ F | Lo (La) = 1000 mH |
| Class I, Division 1, Group D, F, & G |                        |                   |



**OXY / ISM / Temperature Measuring**

Loop Entity Parameters\*: Terminals A, B, C, D, E, F, G, H, I  
 Output: Uo (Voc) = 15 V, Io (Isc) = 20.2 mA, Po = 50.5 mW

|                                      |                        |                  |
|--------------------------------------|------------------------|------------------|
| Class I, Zone 0, Group IIC           | Co (Ca) = 481 nF       | Lo (La) = 90 mH  |
| Class I, Division 1, Groups A & B    |                        |                  |
| Class I, Zone 0, Group IIB           | Co (Ca) = 3.46 $\mu$ F | Lo (La) = 320 mH |
| Class I, Division 1, Groups C & E    |                        |                  |
| Class I, Zone 0, Group IIA           | Co (Ca) = 13.9 $\mu$ F | Lo (La) = 630 mH |
| Class I, Division 1, Group D, F, & G |                        |                  |

**ISM Measuring Loop**

Entity Parameters\*: Terminals E, F  
 Output: Uo (Voc) = 15 V, Io (Isc) = 10.6 mA, Po = 26.6 mW

|                                      |                        |                   |
|--------------------------------------|------------------------|-------------------|
| Class I, Zone 0, Group IIC           | Co (Ca) = 580 nF       | Lo (La) = 300 mH  |
| Class I, Division 1, Groups A & B    |                        |                   |
| Class I, Zone 0, Group IIB           | Co (Ca) = 3.55 $\mu$ F | Lo (La) = 1000 mH |
| Class I, Division 1, Groups C & E    |                        |                   |
| Class I, Zone 0, Group IIA           | Co (Ca) = 14 $\mu$ F   | Lo (La) = 1000 mH |
| Class I, Division 1, Group D, F, & G |                        |                   |

*with MK-COND module, Control Drawing 212.002 130*

**Conductivity Measuring Loop**

Entity Parameters\*: Terminals A, B, C, D, H  
 Output: Uo (Voc) = 5 V, Io (Isc) = 36 mA, Po = 45 mW

|                                      |                        |                  |
|--------------------------------------|------------------------|------------------|
| Class I, Zone 0, Group IIC           | Co (Ca) = 100 $\mu$ F  | Lo (La) = 25 mH  |
| Class I, Division 1, Groups A & B    |                        |                  |
| Class I, Zone 0, Group IIB           | Co (Ca) = 1000 $\mu$ F | Lo (La) = 100 mH |
| Class I, Division 1, Groups C & E    |                        |                  |
| Class I, Zone 0, Group IIA           | Co (Ca) = 1000 $\mu$ F | Lo (La) = 210 mH |
| Class I, Division 1, Group D, F, & G |                        |                  |

**Temperature Measuring Loop**

Entity Parameters\*: Terminals E, F, G  
 Output: Uo (Voc) = 5 V, Io (Isc) = 27 mA, Po = 34 mW

|                                      |                        |                  |
|--------------------------------------|------------------------|------------------|
| Class I, Zone 0, Group IIC           | Co (Ca) = 100 $\mu$ F  | Lo (La) = 50 mH  |
| Class I, Division 1, Groups A & B    |                        |                  |
| Class I, Zone 0, Group IIB           | Co (Ca) = 1000 $\mu$ F | Lo (La) = 200 mH |
| Class I, Division 1, Groups C & E    |                        |                  |
| Class I, Zone 0, Group IIA           | Co (Ca) = 1000 $\mu$ F | Lo (La) = 400 mH |
| Class I, Division 1, Group D, F, & G |                        |                  |

**Conductivity / Temperature Measuring Loop**

Entity Parameters\*: Terminals A, B, C, D, E, F, G, H  
 Output: Uo (Voc) = 5 V, Io (Isc) = 63 mA, Po = 79 mW

|                                      |                        |                 |
|--------------------------------------|------------------------|-----------------|
| Class I, Zone 0, Group IIC           | Co (Ca) = 100 $\mu$ F  | Lo (La) = 8 mH  |
| Class I, Division 1, Groups A & B    |                        |                 |
| Class I, Zone 0, Group IIB           | Co (Ca) = 1000 $\mu$ F | Lo (La) = 30 mH |
| Class I, Division 1, Groups C & E    |                        |                 |
| Class I, Zone 0, Group IIA           | Co (Ca) = 1000 $\mu$ F | Lo (La) = 70 mH |
| Class I, Division 1, Group D, F, & G |                        |                 |

*with MK-CONDI module, Control Drawing 212.002 140*

**Conductivity Measuring Loop**

Entity Parameters\*: Terminals A, B, C, D, H  
 Output: Uo (Voc) = 10 V, Io (Isc) = 97 mA, Po = 121 mW

|                                   |                      |                 |
|-----------------------------------|----------------------|-----------------|
| Class I, Zone 0, Group IIC        | Co (Ca) = 3 $\mu$ F  | Lo (La) = 3 mH  |
| Class I, Division 1, Groups A & B |                      |                 |
| Class I, Zone 0, Group IIB        | Co (Ca) = 20 $\mu$ F | Lo (La) = 12 mH |



Member of the FM Global Group

Class I, Division 1, Groups C & E  
Class I, Zone 0, Group IIA  
Class I, Division 1, Group D, F, & G

Co (Ca) = 100  $\mu$ F

Lo (La) = 24 mH

#### Temperature Measuring Loop

Entity Parameters\*: Terminals E, F, G

Output: Uo (Voc) = 10 V, Io (Isc) = 13 mA, Po = 16 mW

Class I, Zone 0, Group IIC  
Class I, Division 1, Groups A & B  
Class I, Zone 0, Group IIB  
Class I, Division 1, Groups C & E  
Class I, Zone 0, Group IIA  
Class I, Division 1, Group D, F, & G

Co (Ca) = 3  $\mu$ F

Lo (La) = 200 mH

Co (Ca) = 20  $\mu$ F

Lo (La) = 700 mH

Co (Ca) = 100  $\mu$ F

Lo (La) = 1000 mH

#### Conductivity / Temperature Measuring Loop

Entity Parameters\*: Terminals A, B, C, D, E, F, G, H

Output: Uo (Voc) = 10 V, Io (Isc) = 98 mA, Po = 123 mW

Class I, Zone 0, Group IIC  
Class I, Division 1, Groups A & B  
Class I, Zone 0, Group IIB  
Class I, Division 1, Groups C & E  
Class I, Zone 0, Group IIA  
Class I, Division 1, Group D, F, & G

Co (Ca) = 3  $\mu$ F

Lo (La) = 3 mH

Co (Ca) = 20  $\mu$ F

Lo (La) = 12 mH

Co (Ca) = 100  $\mu$ F

Lo (La) = 24 mH

#### Stratos® Pro Type A4abB-c/d. Analyzing Unit

NI / I / 2 / ABCD / T4 Ta = 55 °C; Type 4X

S / II,III / 2 / FG / T4 Ta = 55 °C; Type 4X

I / 2 / Ex nA / IIC / T4, Ta = 65 °C; Type 4X

22 / Ex tD / T85 °C; Type 4X

where

a = Communications: 0, 1

b = Version: 1

c = Measuring Channel 1: MSPH, MSCOND, MSOXY, CC, PH, COND, CONDI, OXY, CO2

d = Measuring Channel 2: 0, MSPH, MSCOND, MSOXY

**MK interface / RS 485 Entity Parameters\***: ST1 Terminals 1, 2, 3, 4, 5

Input: Ui (Vmax) = 5 V, Ii (Imax) = 160 mA, Pi = 200 mW, Ci = 34.7  $\mu$ F, Li = 0

\*Only for MK interface / RS 485 connection to intrinsically safe circuits

#### Equipment Ratings:

Intrinsically safe for Class I, Division 1, Groups A, B, C, and D hazardous (classified) locations, intrinsically safe for Class I, Zone 0, Group IIC hazardous for Group IIC atmospheres, suitable for Class I, Division 2, Groups A, B, C, and D, and suitable for Class I, Zone 2, Group IIC

#### FM Approved for:

Knick Elektronische Meßgeräte GmbH & Co. KG  
Beuckestraße 22 D-14163 Berlin, Germany



Member of the FM Global Group

This certifies that the equipment described has been found to comply with the following Approval Standards and other documents:

|            |      |
|------------|------|
| Class 3600 | 1998 |
| Class 3610 | 2010 |
| Class 3611 | 2002 |
| Class 3810 | 2005 |

Original Project ID: 3037411

Approval Granted: *September 13, 2010*

Subsequent Revision Reports / Date Approval Amended

| Report Number | Date | Report Number | Date |
|---------------|------|---------------|------|
|---------------|------|---------------|------|

FM Approvals LLC

J.E. Marquardt  
Group Manager, Electrical

*13 September 2010*  
Date