

mBC083 Bus Converter

DO NOT OPEN IN EXPLOSIVE ATMOSPHERE



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March 2019

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Revision History

REV	Description	Date	App.
A00	First Release	Jan 28/14	
A01	Hazardous location rating of mBC changed	Aug 21/14	VA
A02	Added warning statement Section 3.2	Sept 08/14	VA
A03	Added caution statements in Sections 3.5 and 3.6; Web site link added in Appendix 2; Figure 5 updated (AdaptaNet); Drawings 10539, 10826, 11631, 11751 updated (AdaptaNet)	Mar 12/15	VB
B00	Changes required to comply with most updated standards on 2018	Aug 2018	VB
B01	Power supply voltage modified	Sep 24/18	VB
B02	Killark Enclosure Added Blanking Glands Added Conditions of Use Added Conduit and Wire Sizing	Oct 27/18	JP
B03	Daisy-chained Ground conductor allowance described in Section 2.3 Enclosure layout and indicators flipped for clarity in Section 2.4 Figures 1 & 2 Hazardous Location Markings updated to include NCC/Inmetro Section 3.1 Figures 3 & 4 RS485 cable specification table modified in Section 3.3 Table 1 Field wiring cable specification clarified in Section 3.4 Address switch settings added on Section 3.5 Table 2 Terminal and Local switch configuration in Section 3.6 Table 3 FM and NCC/Inmetro logos included Appendix 2 Drawing 11784B02 Terminal Lug option added to Appendix 2 Drawing 11752A06 Page 1 and Rotated Enclosure Page 4	Mar 15/19	GS

Table of Contents

1. Overview.....	1
2. Description of Connectors, Operators and Indicators	2
2.1 Installation Requirements.....	2
2.2 Cable Glands and Conduit Entries	2
2.3 Conduit and Wire Sizing.....	2
2.4 Enclosure Layout	3
3. External Wiring	5
3.1 Hazardous Area Location Information.....	5
3.2 Grounding.....	8
3.2.1 Grounding Connection of mBC083 Enclosure and Facility Ground	8
3.2.2 Grounding Connection of mBC083 Top Board and Enclosure.....	8
3.2.3 Grounding Connection Maintenance	8
3.3 Wiring the Power and Communications Network	9
3.4 Wiring the Sensor Bus Network	10
3.5 Setting the Converter's Modbus Address	11
3.6 Terminating the RS-485 Network	13
4. Intrinsically Safe Sensor Bus Operation	14
5. Modbus RS485 RTU Communications.....	16
6. Specifications.....	20
7. Troubleshooting Guide.....	22
8. mBC083 Assembling and Dismantling	26
8.1 Top Board Dismantling	26
8.2 Bottom Board Dismantling	27
8.3 Top Board Assembling.....	27
8.4 Bottom Board Assembling.....	27

Table of Figures

Figure 1: Terminal blocks and operators of bottom board of mBC083.....	3
Figure 2: Connectors, Operators and indicators of top board of mBC083.....	3
Figure 3: Marking for model mBC083.....	5
Figure 4: Marking for model mBC083-1	5
Figure 5 - Typical Data/Power Connections	9
Figure 6: mBC083 Dismantling of Top Board	26
Figure 7: Dismantling of Bottom Board.....	27

1. Overview

The mBC083 Bus Converter is an industrial device mounted in a Hazardous Location enclosure. The device is used to connect up to 32 CMC Intrinsically Safe sensors to a Modbus 485 RTU compatible PLC or computer system.

The Intrinsically Safe Sensor Bus allows the system to be installed in hazardous environments using a fully specified non-hazardous wiring system. Automatic bus tuning is employed to allow a wide variation in network topology and cabling systems. The sensor bus can extend up to 300 meters (1000 feet). The sensor field bus includes a failsafe current limited sensor power supply.

The controller is CAN/US/ATEX/IECEX certified to be safely placed in hazardous areas classified as Class I, II, III Division 1, Groups C, D, E, F & G, Division 1 in US/CAN standards or in non-hazardous areas (for the complete marking see section 3.1). The intrinsically safe output/bus of the bus converter is certified for the same locations as the unit itself. Three conduit entries are provided. Mounting is accomplished using provided mounting holes and it can be mounted on provided mounting plate.

Communication to the host system is via an RS485 multi-drop network using Modbus RTU protocol. The device looks like a simple PLC to the host system. Sensor values and status are continuously available to the host system. Sensor network polling and maintenance are handled automatically in the background. Sensor bus fault detection and recovery are also automatic. The serial communications system is fully isolated.

A simple flashing lamp diagnostic is included to aid field service. This diagnostic identifies open and shorted sensor bus cables. Up to 6 sensor bus and hardware faults are annunciated.

The Intrinsically Safe Sensor Bus uses a unique serial number provided with each sensor for polling. The converter will automatically capture the serial numbers of sensors present on the bus and store them in ascending order. Included in the sensors serial number is also a device code. The device code tells the converter what type of sensor is present and how to process the sensor's data. The sensor data is presented to the host system as a single 16-bit word in 2's complement form.

2. Description of Connectors, Operators and Indicators

2.1 Installation Requirements

To achieve Intrinsically Safe rating, installation in Europe (ATEX) shall be to EN 60079-14 standard and IEC Ex installations shall conform to IEC 60079-14 standard. There are special requirements to comply described throughout this manual and in the drawings contained in the Appendix and provided with the equipment.

2.2 Cable Glands and Conduit Entries

In United States and Canada typical installation is by means of direct conduit connection. For ATEX and IEC Ex a certified cable gland must be used. The correct thread sizes are:

- ½ NPT for Sensor Bus Entry
- ¾ NPT for Modbus RTU Cable Entries

For US and Canada, the mBC083 comes with an approved Blanking Plug for the Modbus RTU conduit opening pre-installed. Even if the unit is stored, the blanking plug must not be removed to remain compliant with Explosionproof/Flameproof rating – this ensures it is not forgotten if put into service. The plug may be moved to either side of the enclosure at the end of line. For ATEX & IEC certification, an approved Blanking Plug must be used. The following aluminum blanking plug is supplied by the factory.

Jurisdictions	Killark P/N
US / Canada / ATEX / IEC Ex	CUP-2-EX

2.3 Conduit and Wire Sizing

The wiring between Bus Converters consists of Ground bonding wires as described in Section 3.2 and Power/Data Cable detailed in Section 3.3 – the ground bonding wire can be daisy chained from one bus converter to the next along with the power/data cable. It is recommended to check the outside jacket diameter when specifying materials – a ¾ NPT conduit normally takes up to quantity 10 #10 AWG wires so there is ample room.

When using more than 8 Bus Converters connected to one system, it is recommended to split into two conduit runs at the headend. Wire sizes can be optimized based on distance and loading – use mBC083 Cable Size Calculator available from the factory representative.

Tip: For short ground wire runs from the headend, #12 AWG may be adequate – the resistance to earth ground is to be less than 1 ohm and can be calculated based on distance.

2.4 Enclosure Layout

Figure 1 and Figure 2 are followed by list with ID callout, corresponding Labels and Description.

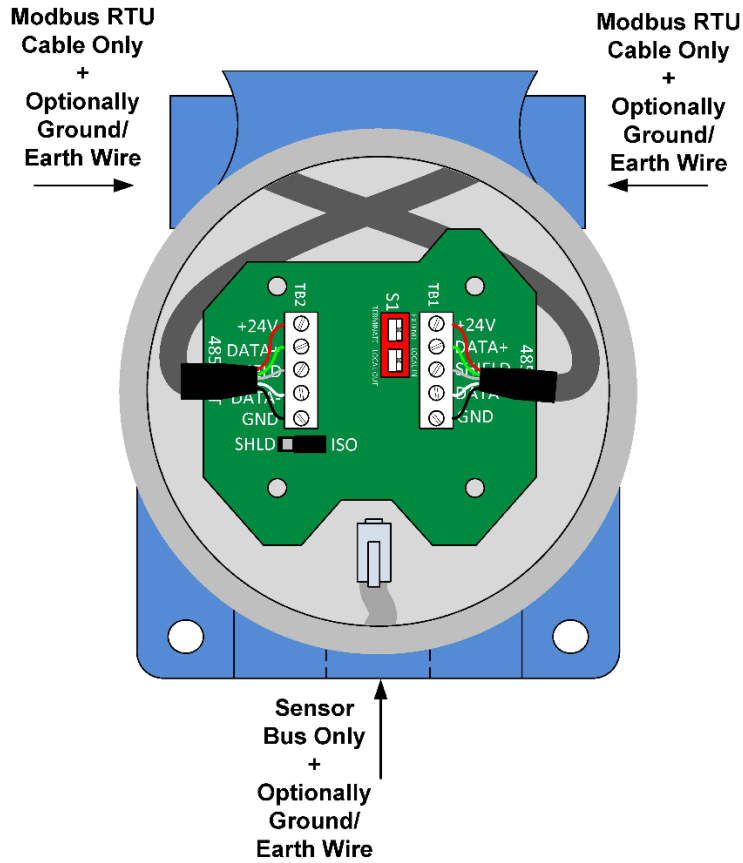


Figure 1: Terminal blocks and operators of bottom board of mBC083

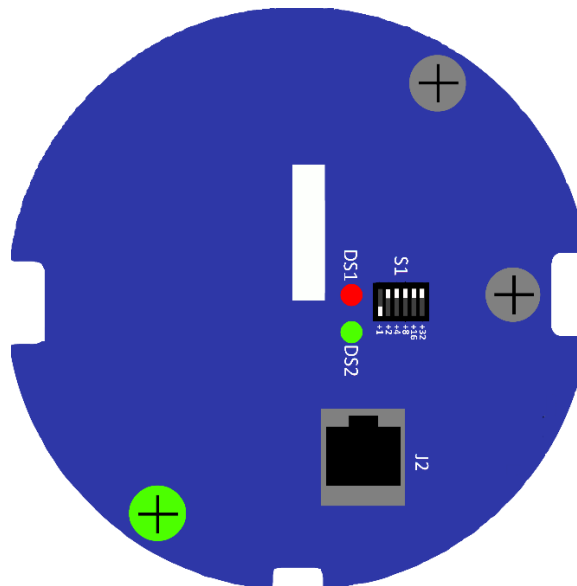


Figure 2: Connectors, Operators and indicators of top board of mBC083

ID	Label	Description
TB1	RS485 IN	Inbound communications and power connections. See drawing 11754 and 11752 in the Appendices for connection details.
TB2	RS485 OUT	Outbound communications and power connections. See drawing 11754 and 11752 in the Appendices for connection details.
DS2	Communications DS2 (green)	Flashes for each valid packet received and replied to. May light continuously, depending on the poll rate.
DS1	Status DS1 (red)	Normal operation, flashing 1 second on / 1 second off; Diagnostics, a series of short flashes followed by 1 second off;

Flashes	Description
1	5VDC supply wire shorted to common wire
2	No sensors detected on the bus
3	Data wire shorted to common wire
4	Data wire shorted to 5VDC wire
5	Excessive bus communications errors during an acquire serial number operation
6	Power on test hardware fault or Flash memory write fault

J2	Sensor bus cable outlet	Conduit hub reserved exclusively for the pre-wired sensor bus cable. See drawing 11751, 10539, 10826 and 11631 for connection details available on website cmciel.com
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S1
Top
board



To set an address turn on the switches that add up to the address required. Switch is shown set for address 3. For address 5, switches marked +1 and +4 would be turned on. Switch is on when moved towards the numbers on the circuit board.

S1
Bottom
board

The TERMINATE/EXTEND switch is used to terminate the RS485 bus. When in the “TERMINATE” position, TB2 is disconnected and the bus is terminated. Only the last device with one communications cable connected, can have this switch set to “TERMINATE”. In the “EXTEND” position, termination is off and the outbound connection, TB2 is connected.

The “LOCAL IN/LOCAL OUT” switch is used to remove this device from the RS-485 network during troubleshooting.

ISO/
SHLD

Jumper to connect isolated common to the shield terminals on TB1 and TB2

3. External Wiring

3.1 Hazardous Area Location Information

The mBC083 has been certified for installation in the following hazardous locations:

11718B03


MODEL: mBC083

WARNING / ATTENTION

Substitution of components may impair Intrinsic Safety/La substitution de composants peut compromettre la sécurité intrinsèque de ce détecteur

To prevent ignition of flammable or combustible atmosphere, disconnect power before servicing / Pour éviter l'inflammation des atmosphères inflammables ou combustibles, coupez l'électricité avant de réviser

FM18US0212X
FM18CA0101X
FM13ATEX0095X
IECEX FMG13.0041X




CLASS I, II, III DIV 1, GROUPS C, D, E, F & G, T6
Provides Intrinsically Safe Circuits for
CLASS I, II, III, DIV 1, GROUPS C, D, E, F & G
TYPE 4X, IP66, -40°C ≤ Ta ≤ 55°C

CE 2809 Electrical / Entity Parameters (Install per drawing DWG 11784)
Um=28 VDC, Uo(Voc)=5.79 VDC, Io(Isc)=2.79 A, Po=4.04 W

Ex II 2(1)GD

Group(s)	Co(Ca)=	Lo(La)=	Lo/Ro=
C,D,E,F,G,IIB, or IIIC	999µF	18.27µH	35.20µH/Ω
D or IIA	999µF	36.54µH	70.40µH/Ω



NCC 19.0038 X

JOB NO: DATE:

Ex tb[ja Da] IIIC T65°C Db

Ex db[ja Ga] IIB T6 Gb

CMC Industrial Electronics, 305-3602 Gilmore Way, Burnaby, BC, Canada, V5G 4W9

Figure 3: Marking for model mBC083

11718-1B03

MODEL: mBC083-1


WARNING / ATTENTION

Substitution of components may impair Intrinsic Safety/La substitution de composants peut compromettre la sécurité intrinsèque de ce détecteur

To prevent ignition of flammable or combustible atmosphere, disconnect power before servicing

Pour éviter l'inflammation des atmosphères inflammables ou combustibles, coupez l'électricité avant de réviser

FM18US0212X
FM18CA0101X
FM13ATEX0095X
IECEX FMG13.0041X




CLASS I, II, III DIV 1, GROUPS C, D, E, F & G, T6
Provides Intrinsically Safe Circuits for
CLASS I, II, III, DIV 1, GROUPS C, D, E, F & G
TYPE 4X, IP66, -40°C ≤ Ta ≤ 55°C

CE 2809 Electrical / Entity Parameters (Install per drawing DWG 11784)
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Ex II 2(1)GD

Group(s)	Co(Ca)=	Lo(La)=	Lo/Ro=
C,D,E,F,G,IIB, or IIIC	999µF	18.27µH	35.20µH/Ω
D or IIA	999µF	36.54µH	70.40µH/Ω



NCC 19.0038 X

JOB NO: DATE:

Ex tb[ja Da] IIIC T65°C Db


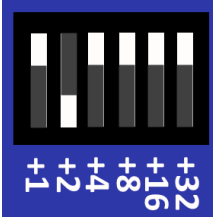




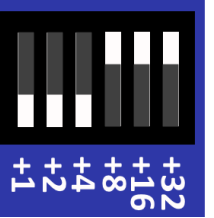


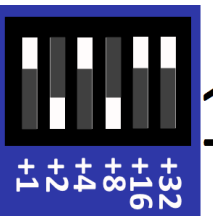
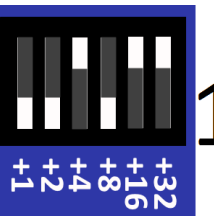
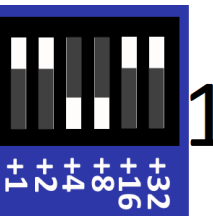
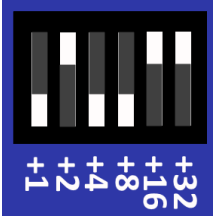
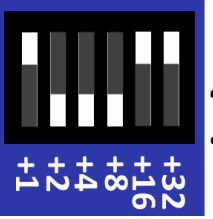
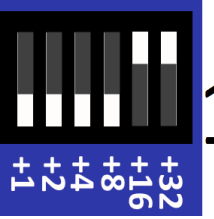
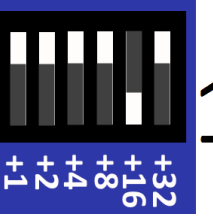
Ex db[ja Ga] IIB T6 Gb

CMC Industrial Electronics, 305-3602 Gilmore Way, Burnaby, BC, Canada, V5G 4W9

Figure 4: Marking for model mBC083-1

To set the converter's address turn on the switches that add up to the address required.

Table 2: Address switch setup

 <p>1</p>	 <p>2</p>	 <p>3</p>	 <p>4</p>
 <p>5</p>	 <p>6</p>	 <p>7</p>	 <p>8</p>
 <p>9</p>	 <p>10</p>	 <p>11</p>	 <p>12</p>
 <p>13</p>	 <p>14</p>	 <p>15</p>	 <p>16</p>

Each address switch adds the number shown to the address. The table above shows how the switch should be set to have addresses 1-16. To add the value to the address the switch needs to be turned towards the printed number on the circuit board.

The address switch is read during the power on sequence. Changes made to the address while the controller is running will not take effect until the next power on cycle or soft reset.

4. Intrinsically Safe Sensor Bus Operation

The converter communicates with the field sensors over an Intrinsically Safe Sensor Bus. The bus voltage levels are 5VDC and the data bus is at 5VDC (high) when idle. The method of signaling is Master-Slave. The Master initiates communication by sending a command sequence. The slave device responds by controlling the bus during pre-defined read time slots.

Each slave device (sensor) has a unique serial number assigned by the manufacturer. Slave devices are selected by polling the bus with the slave's serial number. The serial numbers to be polled are stored in a table within the controller. Only devices specifically designed for use with the converter can be attached to the bus. A list of supported devices and sensors is included in the Appendix 1 of this manual.

Polling of the sensors is automatic and continuous. The entire network of 32 sensors is polled approximately each second. Empty entries in the serial number table are skipped. The new values obtained from the sensors are placed in the sensor value table. The status of each sensor, either on or off line, is maintained in the sensor status registers.

The health of the sensor data bus is reported in the converter's status register. Physical faults with the sensor bus are automatically reported. Status bits indicate the cause of sensor bus faults. Controller hardware and parameter table faults are also indicated.

The sensor bus power supply is current limited and controlled. If a short circuit is detected on the 5 VDC wire, the current is limited and then the power source is turned off. The power source will be returned in 10 seconds. If the power bus is still shorted, the cycle repeats every 10 seconds. No damage will occur to either the data or power portions of the sensor bus due to shorts or open conditions. Do not apply external voltage sources of any kind to the sensor bus. This device remains Intrinsically Safe only if the sensor bus is protected from connection to external energy sources. Local Electrical Code provisions must be followed to ensure that the sensor bus remains Intrinsically Safe.

The sensor serial number consists of eight, single byte (8-bit) numbers. The converter has a 32 entry table for the serial numbers. Sensors are polled from this table, starting from table entry 1. The converter stores the serial number table in flash memory. The serial numbers can be read from the table over the Modbus Network using a group of scratch pad registers. The serial number consists of:

Byte	Description
1	Sensor device code
2	MSB of serial number
3	Byte 5 of serial number
4	Byte 4 of serial number
5	Byte 3 of serial number
6	Byte 2 of serial number
7	LSB of serial number
8	Checksum of serial number

The converter has a command register that allows operations to be controlled over the Modbus Network. One of these commands allows the setting of sensor serial number table entries from the values stored in the scratchpad registers. See **Section 5. Modbus 485 RTU Communications** for details.

A second command can automatically obtain the serial numbers of the sensors connected to the bus. A special sequence is initiated, which uses a high-speed algorithm to obtain the serial numbers. A third command allows the clearing of the serial number table. See **Section 5. Modbus 485 RTU Communications** for details on initiating the serial number search and clear commands.

If the serial number table is clear when the acquire serial number command is executed, the serial numbers located will be placed in the table in ascending order. If the table contains previously located serial numbers, the controller will follow this sequence to store the new serial numbers;

- 1) All of the serial numbers currently attached to the sensor bus will be located and stored in a temporary table;
- 2) The temporary table will be verified against the existing table and any serial numbers from the existing table not found in the temporary table will be deleted from the existing table;
- 3) Any new serial numbers from the temporary table not found in the existing table will be placed in the existing table in ascending order starting with the first empty space;

This method of operation allows replacement sensors to be located and added to the table without disturbing the table positions of the pre-existing sensors. The serial number table may not be in true ascending order after completion of an acquire command with a previously populated sensor serial number table.

5. Modbus RS485 RTU Communications

The controller communicates with a host computer or PLC over an RS-485 network using the Modbus RTU protocol. The settings for the communications network are 19200 Baud, no parity and 1 stop bit. The memory of the controller has been configured to simulate a PLC with 47, 16 bit registers. These registers are allocated as follows:

Register	Type	Description
40001	R/W	<p>Sensor number</p> <p>Setting this register causes the serial number for the selected sensor to be loaded immediately into registers 40002 – 9.</p> <p>The sensor number is also used for the write sensor serial number command. The values in registers 40002 – 9 will be written to the location specified by this register upon execution of a write serial number command.</p> <p>The range of sensor numbers is 1 – 32. Setting the sensor number to 0 will return all zeros in the scratchpad registers. Unused serial numbers are set to all 255's (0x0FF).</p>
40002 - 9	R/W	<p>Sensor serial number</p> <p>The values entered in these registers are the sensor's serial number. The sensor table entry is selected by register 40001. Each 16 bit register contains 1 byte (8 bits, right justified) of the serial number. The serial number is represented as follows:</p> <p>40002 - The device code</p> <p>40003 – The most significant byte of the serial number</p> <p>40004 – Byte 5 of the serial number</p> <p>40005 – Byte 4 of the serial number</p> <p>40006 – Byte 3 of the serial number</p> <p>40007 – Byte 2 of the serial number</p> <p>40008 – The least significant byte of the serial number</p> <p>40009 – The checksum of the serial number</p> <p>The range of each serial number byte is from 0 – 255. If all bytes are set to 255 (0x0FF), the entry is not polled during communications.</p>

40010	R/W	<p>Command register</p> <p>The command register contains a series of bits that initiate operations within the controller. To initiate an operation, set the associated bit. The controller automatically clears the bits when the operations are initiated. A list of the bits and their functions:</p> <table border="0" style="width: 100%;"> <tr> <td style="width: 10%; text-align: right;">0</td> <td style="width: 40%;">Soft reset</td> <td>Reset the controller, equivalent to a power on reset.</td> </tr> <tr> <td style="text-align: right;">1</td> <td>Write serial no from scratch</td> <td>Write the serial number from registers 40002 – 9 to the table entry indicated in register 40001.</td> </tr> <tr> <td style="text-align: right;">2</td> <td>Acquire serial numbers</td> <td> <p>Automatically acquire the sensor serial numbers for all sensors connected to the bus. If the table was cleared before performing this operation, the serial numbers will be retrieved and stored in ascending order</p> <p>If the sensor serial number table was already populated, sensors that existed in the table would remain in their previous locations. Sensors that were in the table, but not detected during this operation would be deleted. Any new sensors detected would be added to the blank spaces in the table in ascending order. The new table may now not be in ascending order. This method of operation allows the controller to acquire replacement sensors without disturbing the remaining sensors table positions.</p> </td> </tr> <tr> <td style="text-align: right;">3</td> <td>Clear serial no's</td> <td>Clear the serial number table of all existing entries. The table will be filled with 255's (0x0FF) and no sensors will be polled on the bus.</td> </tr> <tr> <td style="text-align: right;">8</td> <td>Channel select 0</td> <td>On multi-channel sensor devices, select channel 0 for all sensors.</td> </tr> <tr> <td style="text-align: right;">9</td> <td>Channel select 1</td> <td>On multi-channel sensor devices, select channel 1 for all sensors.</td> </tr> <tr> <td style="text-align: right;">10</td> <td>Channel select 2</td> <td>On multi-channel sensor devices, select channel 2 for all sensors.</td> </tr> <tr> <td style="text-align: right;">11</td> <td>Channel select 3</td> <td>On multi-channel sensor devices, select channel 3 for all sensors.</td> </tr> </table>	0	Soft reset	Reset the controller, equivalent to a power on reset.	1	Write serial no from scratch	Write the serial number from registers 40002 – 9 to the table entry indicated in register 40001.	2	Acquire serial numbers	<p>Automatically acquire the sensor serial numbers for all sensors connected to the bus. If the table was cleared before performing this operation, the serial numbers will be retrieved and stored in ascending order</p> <p>If the sensor serial number table was already populated, sensors that existed in the table would remain in their previous locations. Sensors that were in the table, but not detected during this operation would be deleted. Any new sensors detected would be added to the blank spaces in the table in ascending order. The new table may now not be in ascending order. This method of operation allows the controller to acquire replacement sensors without disturbing the remaining sensors table positions.</p>	3	Clear serial no's	Clear the serial number table of all existing entries. The table will be filled with 255's (0x0FF) and no sensors will be polled on the bus.	8	Channel select 0	On multi-channel sensor devices, select channel 0 for all sensors.	9	Channel select 1	On multi-channel sensor devices, select channel 1 for all sensors.	10	Channel select 2	On multi-channel sensor devices, select channel 2 for all sensors.	11	Channel select 3	On multi-channel sensor devices, select channel 3 for all sensors.
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11	Channel select 3	On multi-channel sensor devices, select channel 3 for all sensors.																								

40011	R	<p>Status Register</p> <p>This register indicates the internal status of the converter and the sensor bus. A set bit indicates a fault. The fault assigned to each bit is as follows:</p> <ul style="list-style-type: none"> 0 Bus data shorted low The data wire is shorted to the common wire. 1 Bus data shorted high The data wire is shorted to the 5VDC wire. 2 No Sensors present No sensors are present on the sensor bus, or the sensor bus data wire is open. 3 Bus power overload The 5VDC wire is shorted to the common wire. 4 Excessive bus errors During an acquire serial number operation, the converter detected excessive bus errors. This condition would indicate faulty sensor bus cabling, or excessive electrical interference on the sensor data bus. 8 Sensor bus fault A sensor bus fault is present 9 Sensor table overflow More than 32 sensors were detected during a sensor serial number acquire operation. 10 Unsupported Sensor detected A sensor was detected in the serial number table that is not supported by this converter. 11 In acquire An acquire sensor serial numbers operation is in progress. 13 RAM fault The converters RAM did not pass the power on test. 14 Parameter table fault The parameter table checksum is invalid or a write to the parameter table flash memory has failed. 15 Firmware fault The converters flash memory firmware failed the power on CRC test.
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40012 - 13	R	Sensor status Each bit of these registers represents a single sensor. If the bit is set the sensor is faulted and not available. If the bit is clear the sensor is online. Bit 0 of register 40012 represents sensor 1. Bit 31 of register 40013 represents sensor 32.
40014 - 45	R	Sensor values Each of these registers represents a sensors raw 2's complement value. The value is right justified, with the MSB representing the sign. Sensors that are offline have a forced value of +4095.
40046	R	Watchdog counter, increments every second and rolls over at 65535
40047	R	Channel 0 - Software Version Channel 1 - Address switch setting

6. Specifications

Description	Characteristic
Intrinsically Safe Sensor Bus Voltage Current Communications Distance	5 VDC 125mA, electronically limited Single-Wire Bus 305m (1000ft)
DC Power Supply Voltage Current	SELV/PELV PS only - 19 to 28 VDC 125mA @ 24VDC maximum
Communication Standard Distance Input Load Termination	RS485 differential isolated 500m (1640ft) 96kΩ, 1/8 load standard 120Ω balanced line
Environment Temperature Relative Humidity	-40°C to +55°C (-40°F to 131°F) 0 to 95% non-condensing
Enclosure Make and Material Dimensions RS-485 Bus conduit opening Single-Wire Bus conduit opening	Cast aluminum with glass window See dimensional drawings below ¾" NPT ½" NPT
Hazardous Location Ratings CAN/US ATEX/IECEX	Class I, II, III, Div 1, Groups C, D, E, F & G & 2, T6 Type 4X, IP66, -40°C ≤ Ta ≤ 55°C IECExFMG13.0041X Ex db[ia Ga] IIB T6 Gb Ex tb[ia Da] IIIC T65°C Db II 2(1)GD CE 2809



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7. Troubleshooting Guide

CAUTION: When troubleshooting the Bus Converter and associated wiring, only use tools suited for the location rating where the operation takes place.

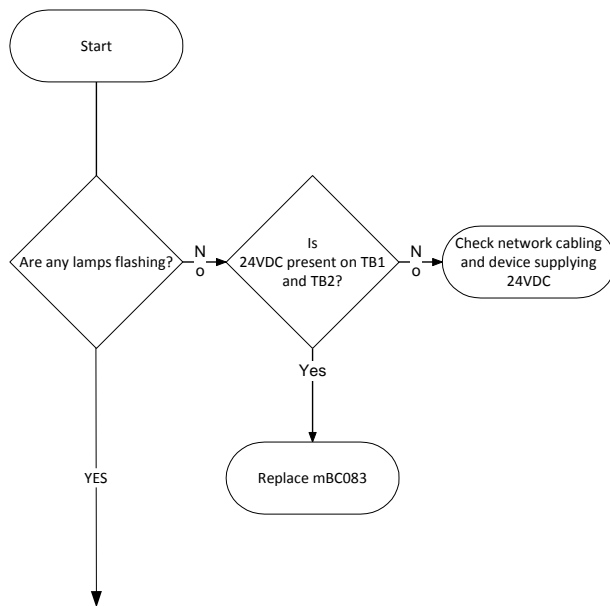
Before attempting troubleshooting, familiarize yourself with the indicator lamps and address switch settings detailed in section 2 Description of Connectors, Operators and Indicators.

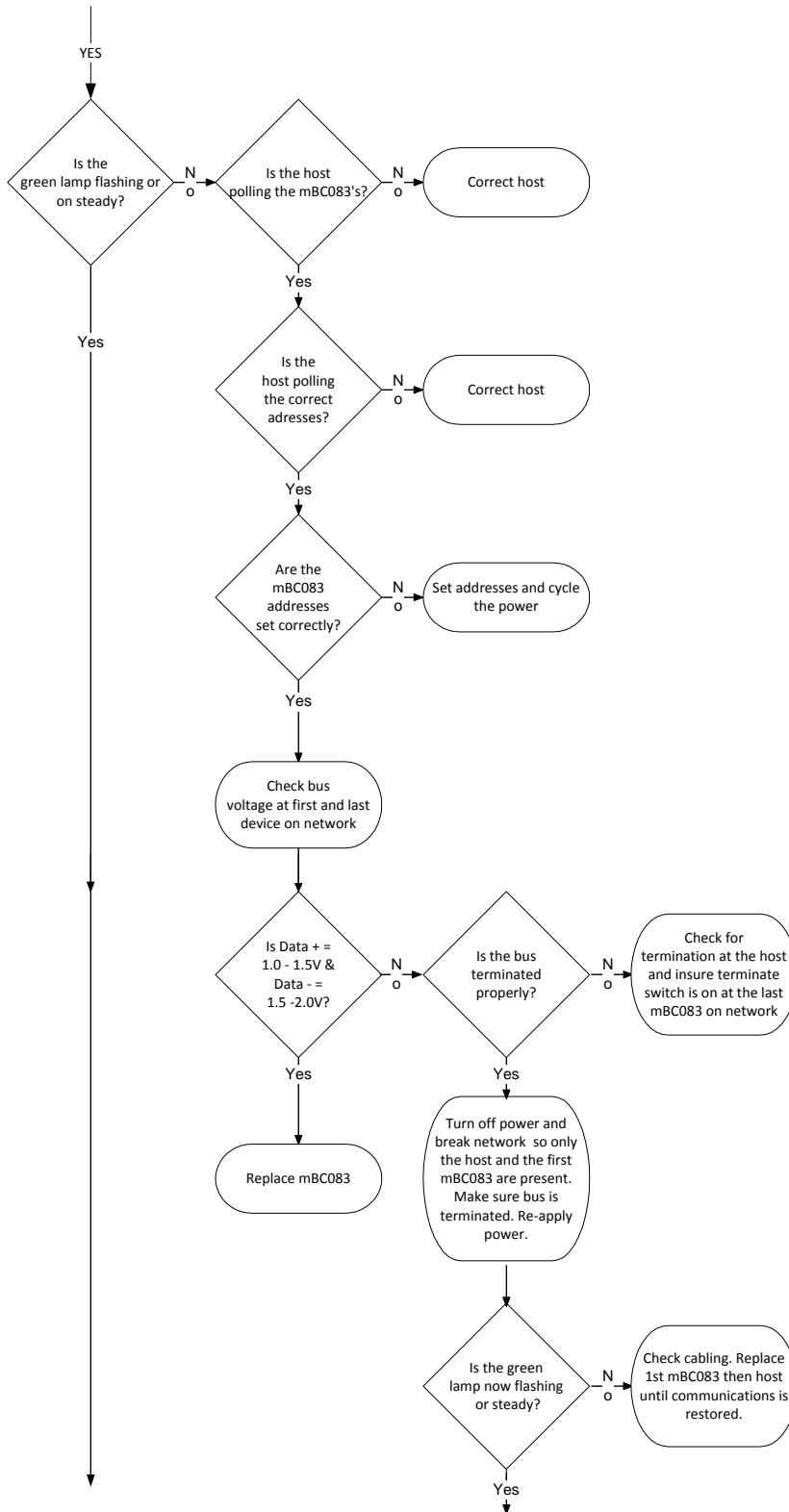
There are 2 basic systems operating within the mBC083. The first is the Modbus RTU RS485 communications network. This network connects multiple mBC083's to a single Host or Master device. It is the host that polls for data from the mBC083. Before starting this guide, insure that the host is running and polling the mBC083's.

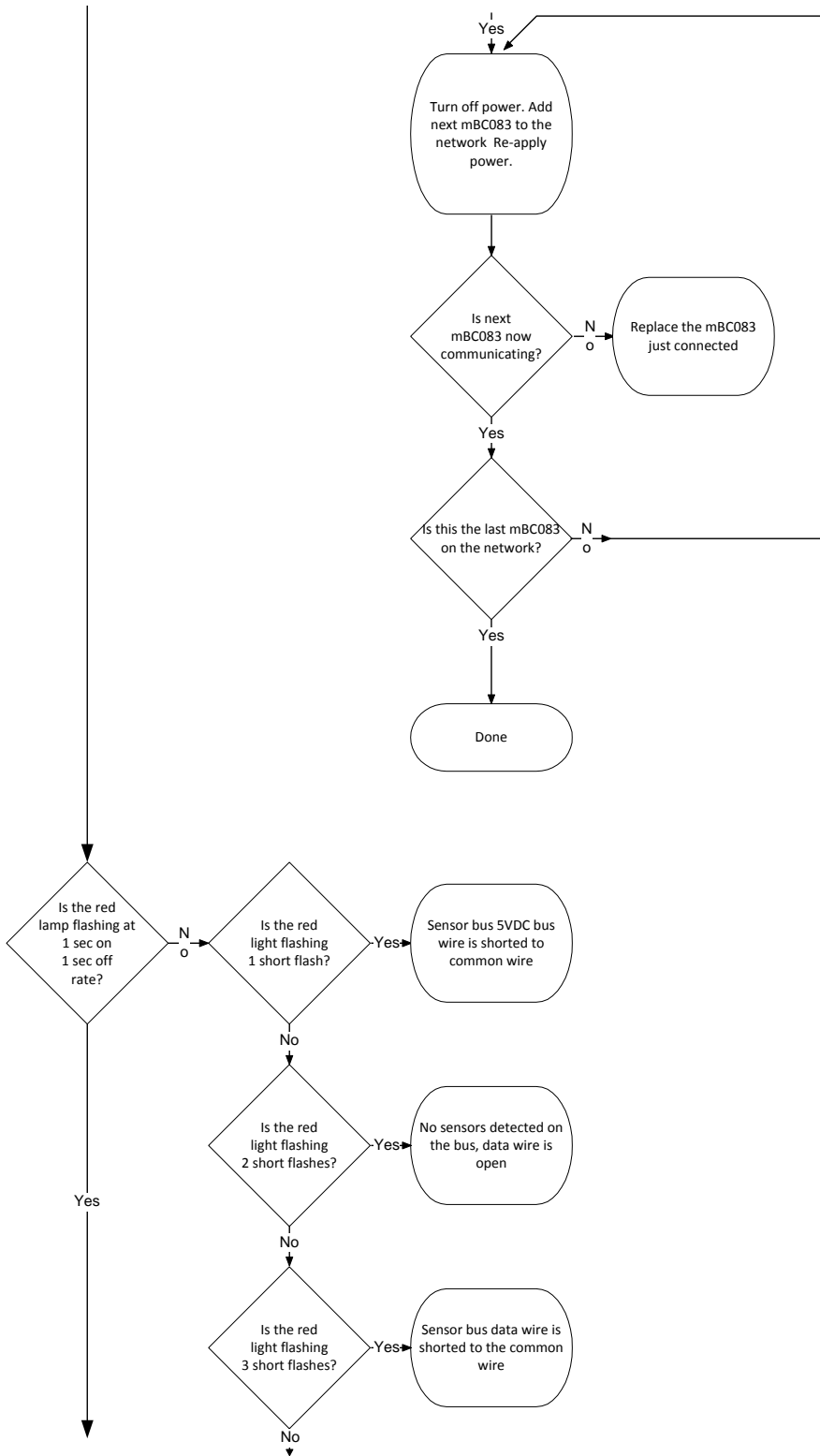
The second system is the sensor bus network. The mBC083 manages the sensor bus and continually polls for sensors in its serial number table. Before starting this guide verify that the sensor serial numbers table in the mBC083's are correct. The status lamp on each mBC083 provides information as to the state of the sensor bus. The mTB006 status lamps and switches can be used to isolate network segments during troubleshooting. To isolate a defective cable or sensor, start at the mTB006 closest to the mBC083 and disable outgoing network segments using the switches. Observe the lamps on the mTB006 as you switch in additional segments. If a segment has a shorted cable or sensor, the lamps will go out when that segment is added. Note if the power conductor is shorted, the mBC083 will turn off the 5VDC supply. Wait for at least 10 seconds to see if power is restored.

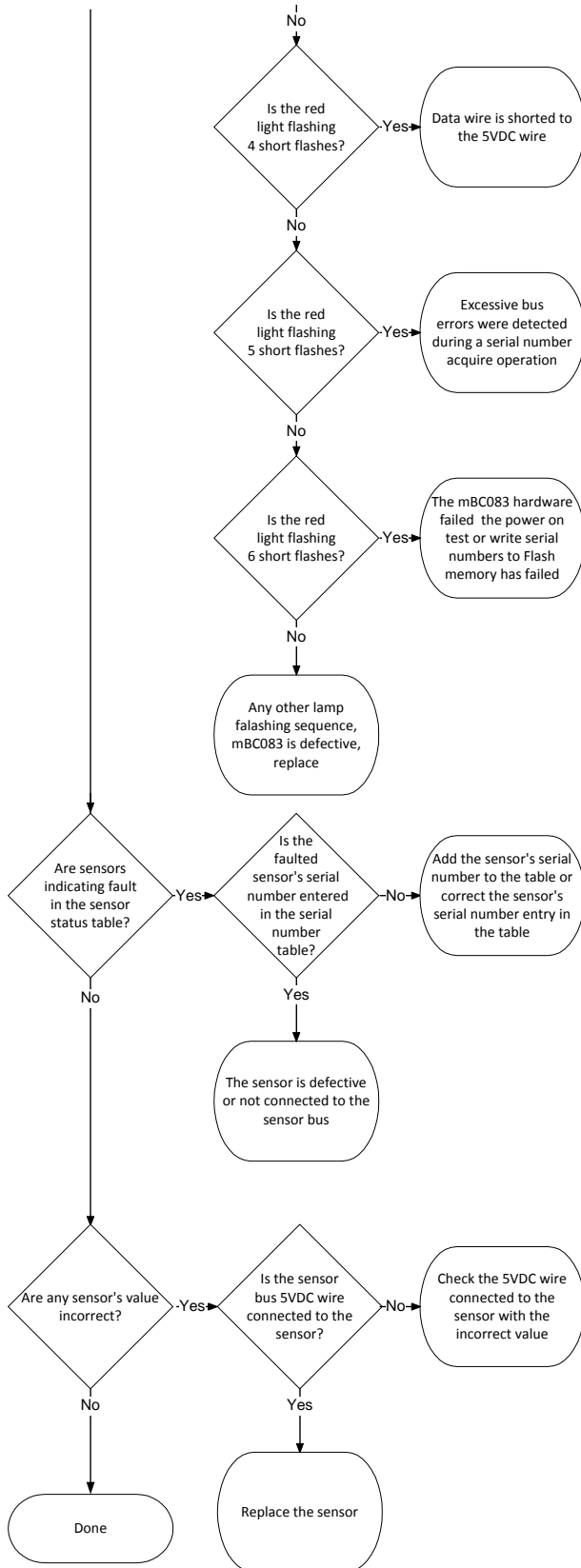
Note:

If the board is found faulty no repairs are allowed. The faulty board must be removed from the enclosure and send to CMC for repair or the faulty board will be replaced by a new one. For details how to remove the top board, see section 8 mBC083 Assembling and Dismantling.









8. mBC083 Assembling and Dismantling

Note: Use dry or damp clean cloth to clean the exterior of bus converter enclosure prior to its opening to avoid any dust build up falling into the enclosure on the electronics.

If the top or bottom boards are removed from the enclosure they must be mounted back properly to comply with all standards for intrinsic safety.

8.1 Top Board Dismantling

The top board is mounted on three aluminum standoffs and it is fastened by 2 screws and one standoff with star lock washers. To remove the top board these two screws and standoff have to be removed and the board can be then pulled out of the enclosure.

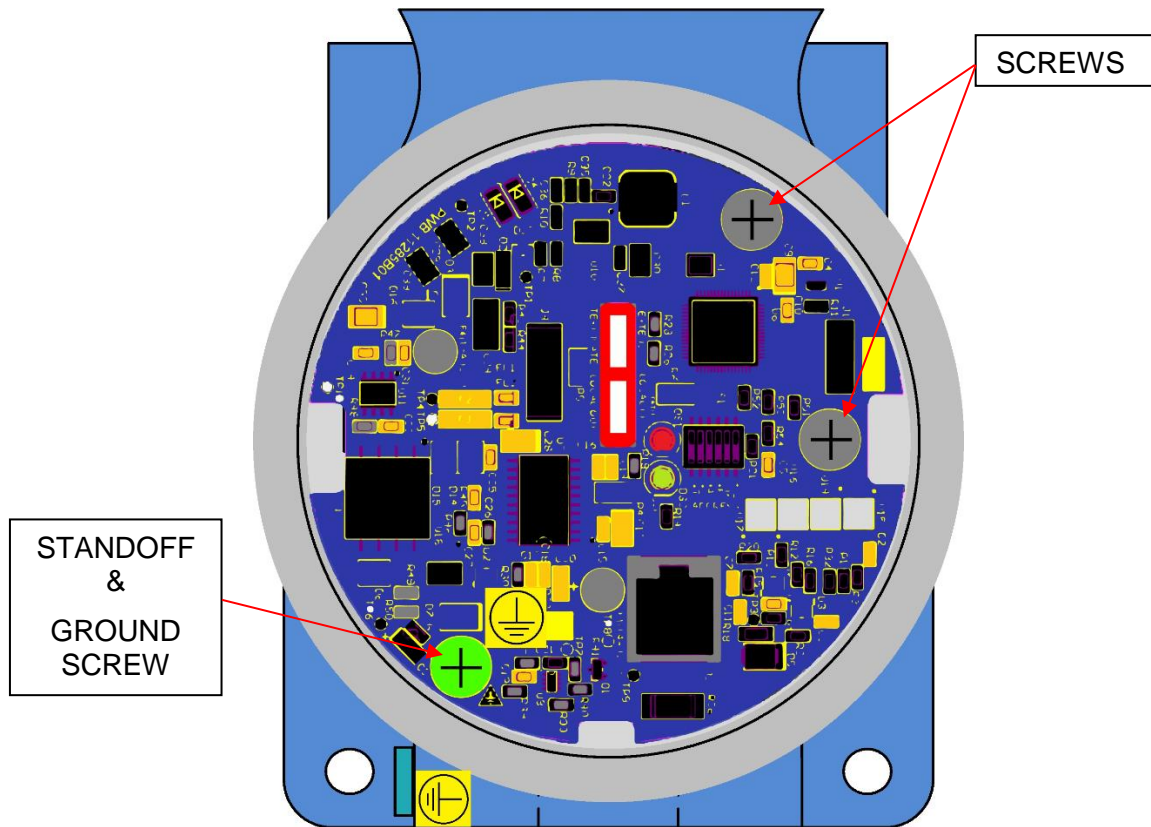


Figure 6: mBC083 Dismantling of Top Board

8.2 Bottom Board Dismantling

Note:

There shouldn't be a reason to remove the bottom board unless the board was damaged and needs a replacement.

The bottom board is mounted on 4 standoffs and it is fastened by 4 screws with star lock washers.

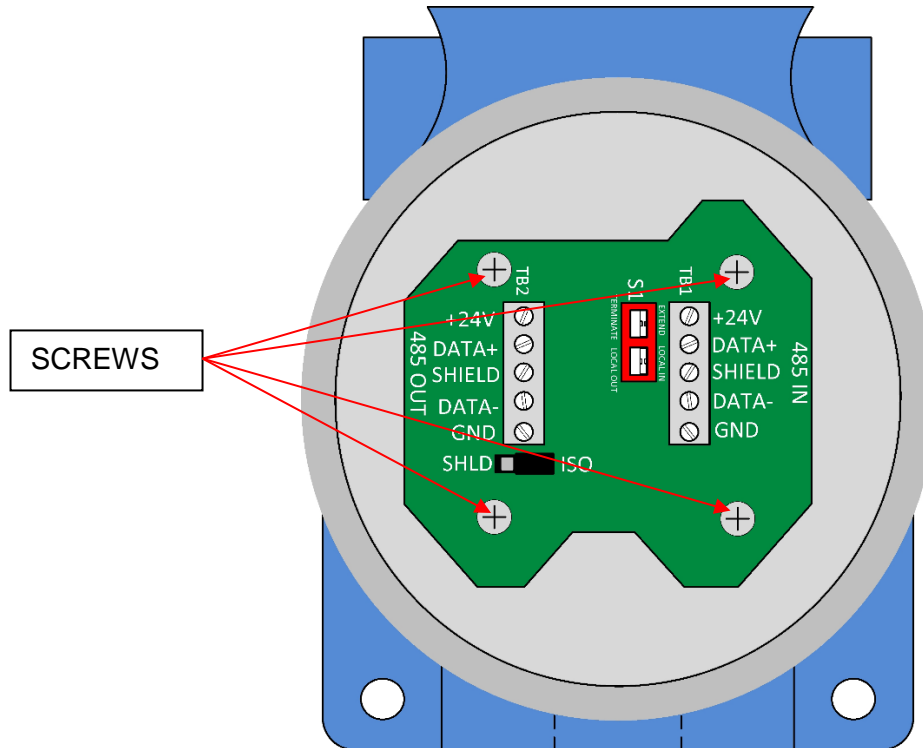


Figure 7: Dismantling of Bottom Board

8.3 Top Board Assembling

The top board is mounted by using two screws and one standoff as it is on figure 10. When the top board is being connected and mounted into the enclosure it is very important that parts which play a role in infallible grounding connection to the enclosure are mounted properly. For details see drawing 11752 mBC083 Housing Assembly Details. All standoffs and screws which are marked as crucial parts for infallible ground connection in the 11752 drawing must be protected from loosening and then be regularly checked to maintain the intrinsic safety.

8.4 Bottom Board Assembling

The bottom board is mounted by using 4 screws as it is on figure 11. When the bottom board is being mounted into the enclosure it is very important that parts which play a role in infallible grounding connection to the enclosure are mounted properly. For details see drawing 11752 mBC083 Housing Assembly Details. All standoffs and screws which are marked as crucial parts for infallible ground connection in the 11752 drawing must be protected from loosening and then be regularly checked to maintain the intrinsic safety.

Appendix 1 – Supported Sensors

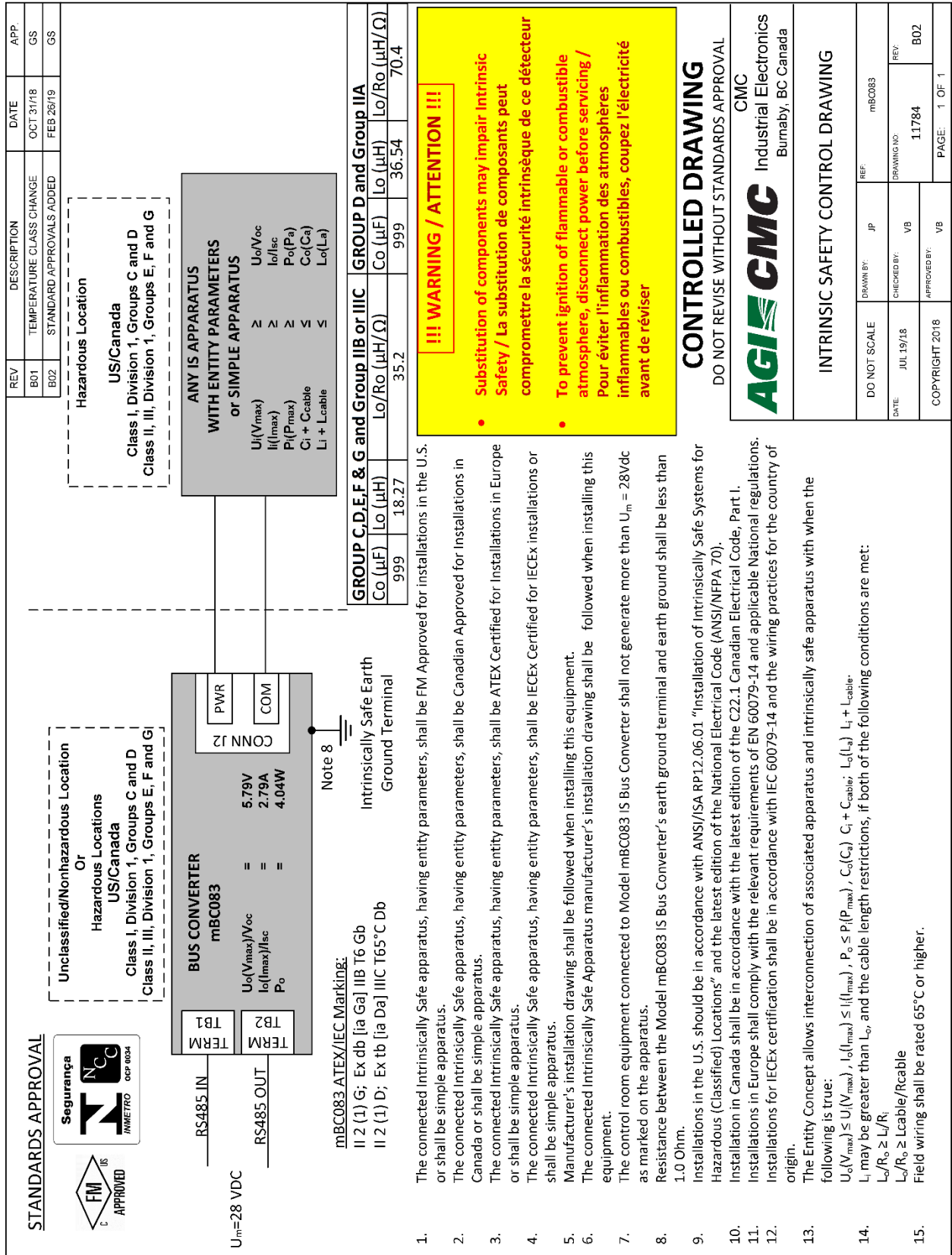
Only sensors supplied and approved by CMC Industrial Electronics can be used in Intrinsically Safe systems. A wide variety of sensors are available. Contact the factory or our web site www.cmciel.com for a list of available sensors for this system.

Appendix 2 – Installation Drawings

The following is a list of the installation drawing in this appendix:

All drawings and manuals referred to mBC083 are available on our website WWW.CMCIEL.COM

11784	Intrinsic Safety Control Drawing
11752	mBC083 Housing Assembly Details
11753	mBC083 Housing Dimension Details
11754	mBC083 Modbus RTU Data Network Details
HKB-GL	mBC083-1 Housing Dimension Details



INTRINSICALLY SAFE ENCLOSURE EARTH GROUND CONNECTION

REV	DESCRIPTION	DATE	DRAWN	CHECKED	APP.
A04	KILLARK ENCLOSURE ADDED	OCT 24/18	JP	GS	GS
A05	NOTE FOR BLANKING PLUG ADDED	NOV 16/18	JP	GS	GS
A06	INTERCONN. LUG OPT. ADDED TITLE BLOCKS REORGANIZED	JAN 10/19	JP	GS	GS

Provided Parts	
	Ring terminal to be crimped onto #10-12AWG copper stranded wire. See Detail A opt. #1, Detail B and note #2.
	Ground screw #6-32 installed in the board standoff with #6 washer marked as Earthing point A in this drawing.
	Enclosure ground screw installed in the outer enclosure grounding terminal with #8 star washer. See Detail A opt. #1, Detail A opt. #2, Detail B and note #2.
	Screw lug. See Detail A option #2 and note #3

EARTHING POINT A

EARTHING POINT B mBC083-1

EARTHING POINT B mBC083

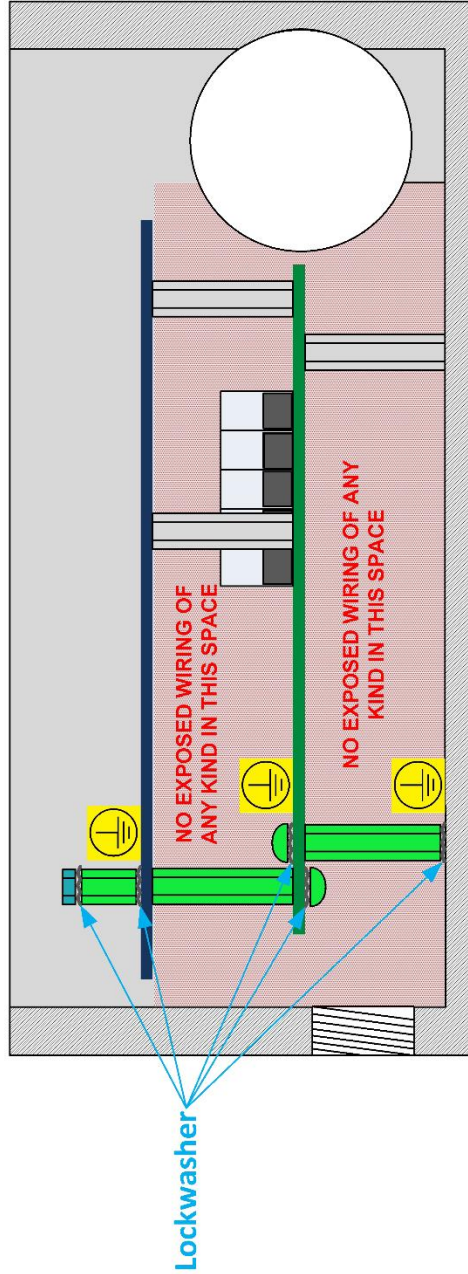
Detail of IS earth ground terminal installation

Each terminal involved in Intrinsically Safe grounding **MUST BE PREVENTED FROM LOOSENING**

NOTES:

1. Enclosure of Bus Converter mBC083 must be connected to a facility earth ground by wire which has resistance lower than 1Ω.
2. The connection to the earth ground can be achieved by connecting the bonding wire to the Earthing Point [A] on the bus converter board (preferable) OR by connecting grounding wire onto the outer Earthing Point [B] on the enclosure, both shown above. Star washer must be used as detailed to bond earth ground wire to standoff or enclosure.
3. Use lug for daisy chain earth ground connection inside enclosure. Using the lug assures the continuous connection of earth ground even when one bus converter board is removed from the system.
4. The grounding wire must be connected directly to the facility earth ground.
5. The grounding connection must be regularly and frequently checked.
6. For enclosure rating see page 5
7. Install 3/8 NPT Blanking Plug Killark P/N CUP-2-EX for US/Canada/ATEX/IECEx, in either location at the end of line

Intrinsically Safe Bus Converter Board Ground Connection



NOTES:

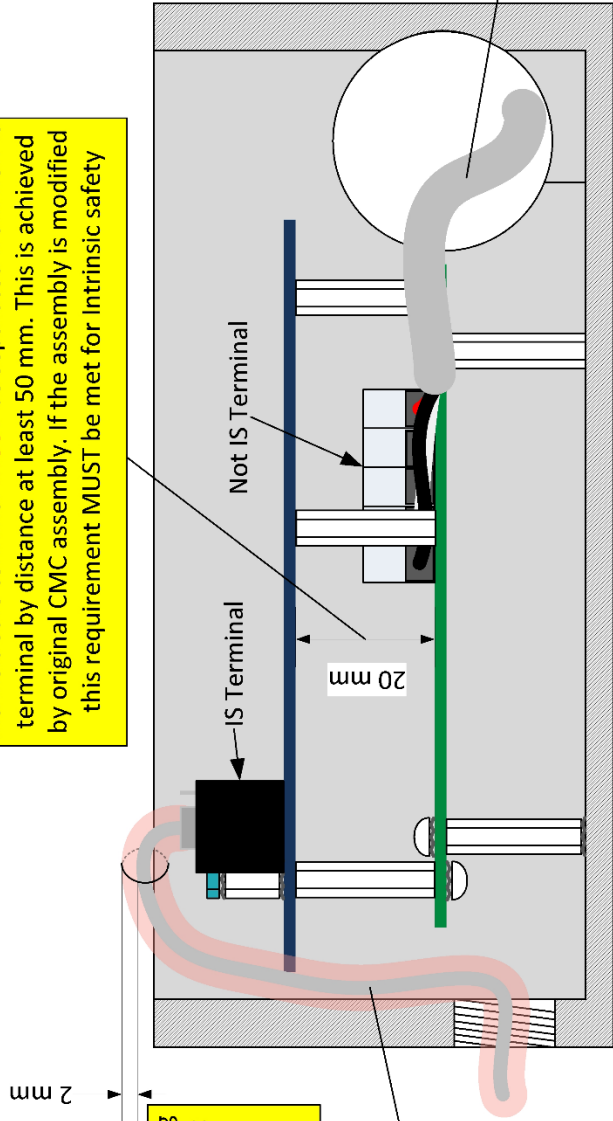
1. All components which are involved in connecting the bus converter board to the enclosure **MUST** be protected from loosening by using supplied parts
2. The resistance between the ground of the board and enclosure **MUST** be less than 1Ω
3. Standoffs marked by green color █ are crucial for the infallible mBC083 top board ground connection and must be fastened using star lock washer

Board Ground Connection
CONTROLLED DRAWING

AGI CMC	
DRAWING NO.	11752
REV.	A06
PAGE:	2 OF 5

Intrinsically Safe Bus Converter Wiring and Spacing

Intrinsic Safe terminal **MUST** be separated from non-IS terminal by distance at least 50 mm. This is achieved by original CMC assembly. If the assembly is modified this requirement **MUST** be met for Intrinsic safety



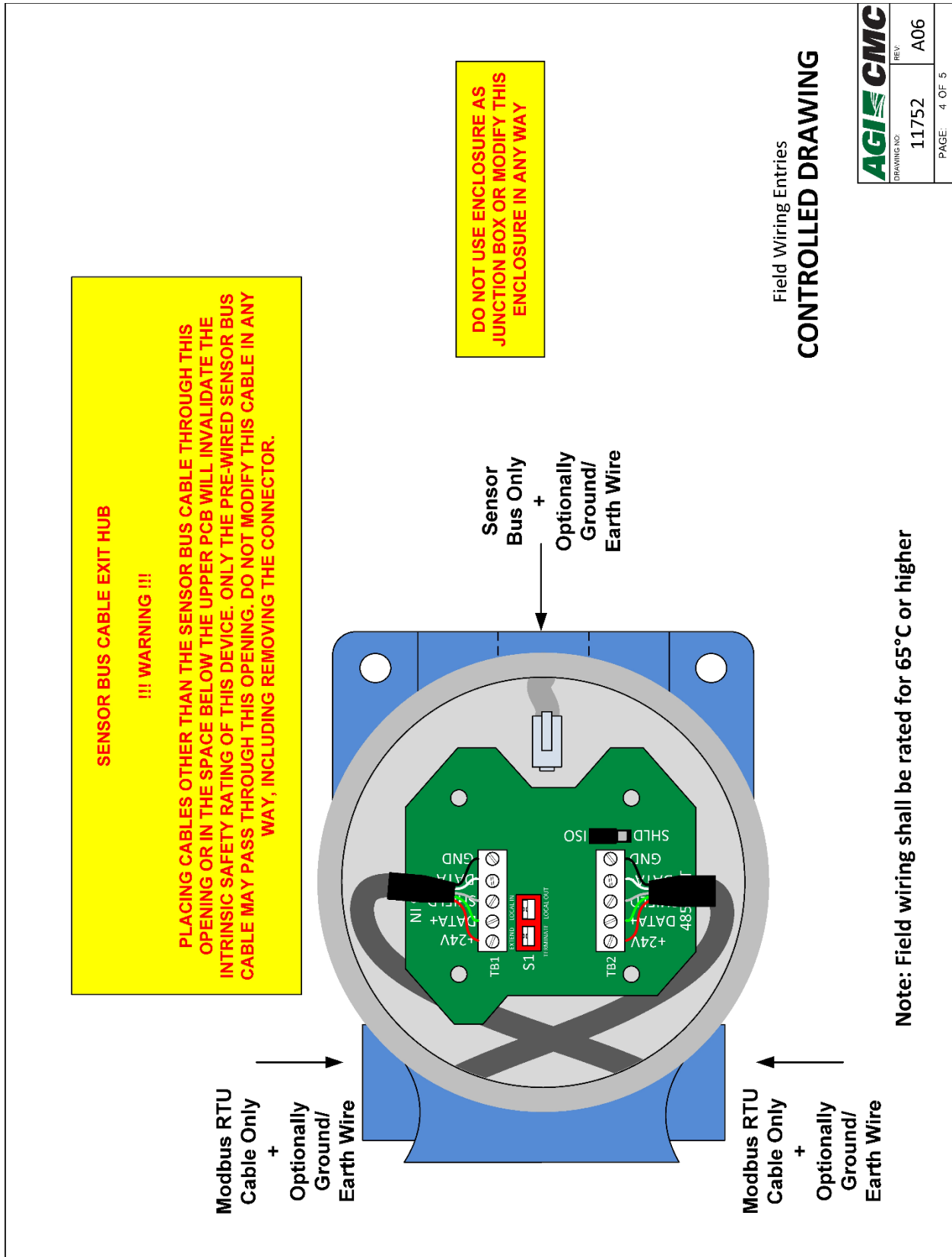
Intrinsically Safe wiring **MUST** be separated at least 2 mm from any other not IS wiring. See note #1

NOTES:





1. If the requirement for the 2 mm separation between the IS and non-IS wiring can't be met there **MUST** be at least 0.25 mm insulation on the wires which violate the required distance. If these wires with the thicker insulation will touch, the distance created by the insulation will be at least 0.5 mm.

Wiring and Spacing
CONTROLLED DRAWING

AGI CMC	
DRAWING NO. 11752	REV. A06
PAGE: 3 OF 5	

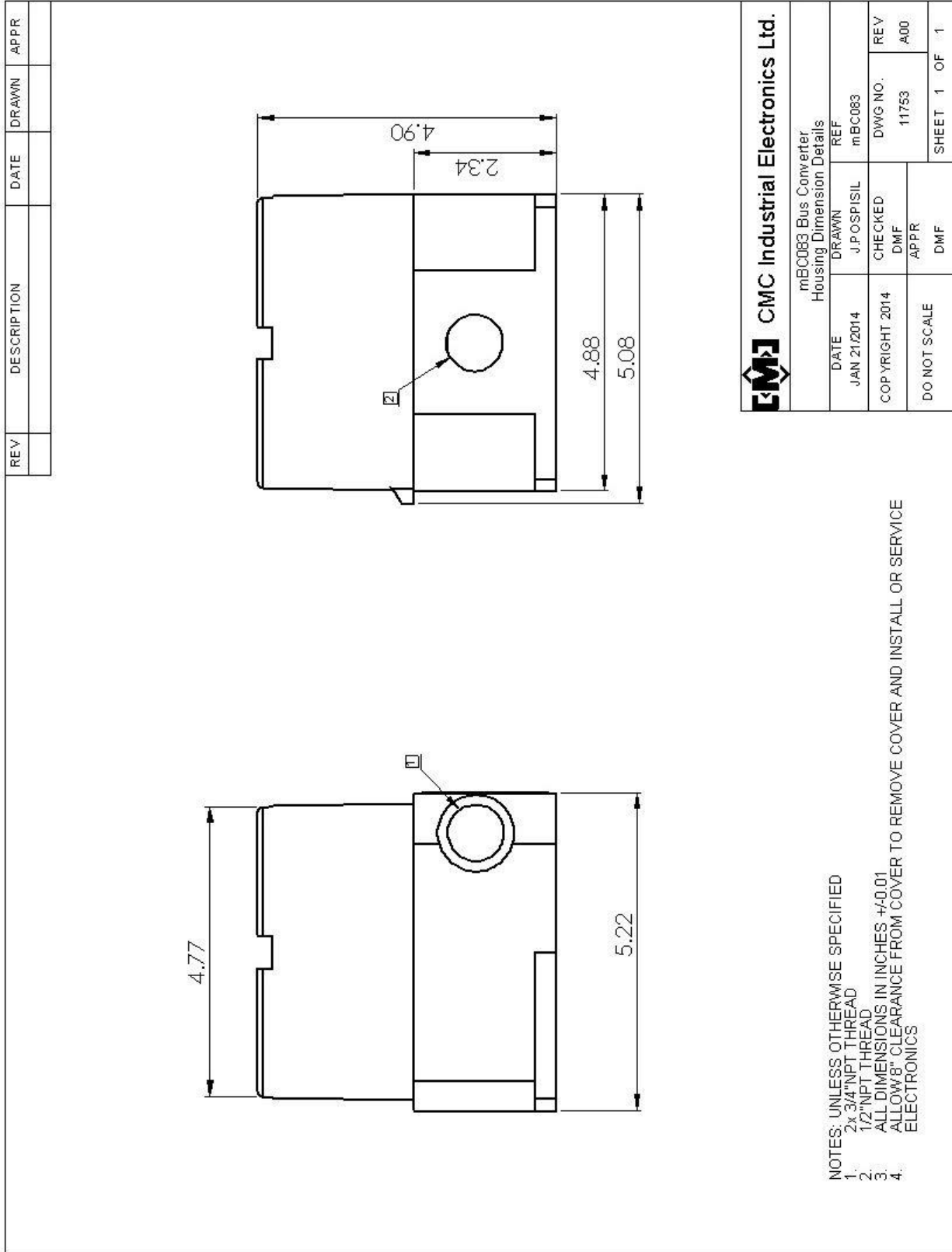


LIST OF APPROVED ENCLOSURES & Bus Converter Model Number:

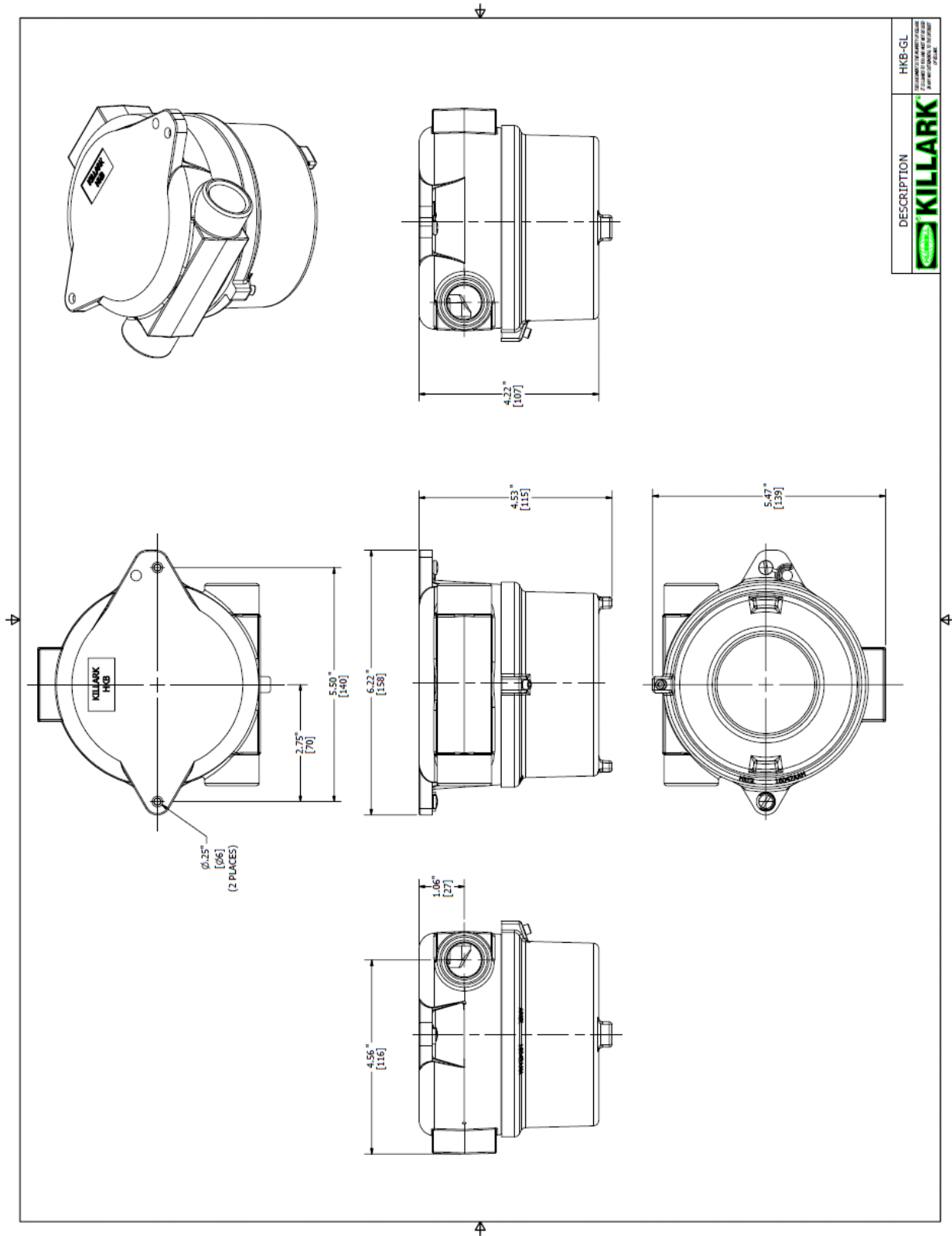
CMC P/N	Manufacturer of Enclosure & P/N	Certificates & Ratings
mBC083	International Metal Engineering Pte 8092WM-04	 IME MODEL 8092WM-04 CLASS I, DIV 1, GROUPS B, C AND D CLASS II, III, DIV 1, GROUPS E, F AND G ENCLOSURE – NEMA TYPE 4X, IP66/67 OPERATING AMBIENT RANGE -40°C TO +85°C II 2GD, Ex d IIC Gb, Ex tb IIIC Db, IP66 NOTIFIED BODY NO: 0518  SIRA 08 ATEX 1082U, IECEx SIR.08.0025U
mBC083-1	KILLARK HKB-GL	 CLASS I, GROUPS B, C AND D CLASS II, GROUPS E, F AND G CLASS III, ENCL. 3 & 4 0539  II 2 G D Ex db IIC Gb Ex tb IIIC Db IP66 SERVICE / AMBIENT LENS COVER -20°C TO +60°C SERVICE / AMBIENT BLANK COVER -20°C TO +70°C UL DEMKO 01 ATEX 015742U, IECEx UL 14.0071U

List of Approved Enclosures
CONTROLLED DRAWING

AGI CMC	
DRAWING NO. 11752	REV. A06
PAGE: 5 OF 5	



CMC Industrial Electronics Ltd.			
mBC083 Bus Converter Housing Dimension Details			
DATE	DRAWN	J POSISIL	REF
JAN 21/2014	DMF	DMF	mBC083
COPYRIGHT 2014	CHECKED	DWG NO.	REV
DMF	DMF	11753	A00
DO NOT SCALE	APPR		
	DMF		SHEET 1 OF 1



DESCRIPTION	
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